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# DISCOVERY

## A Monthly Popular Journal of Knowledge

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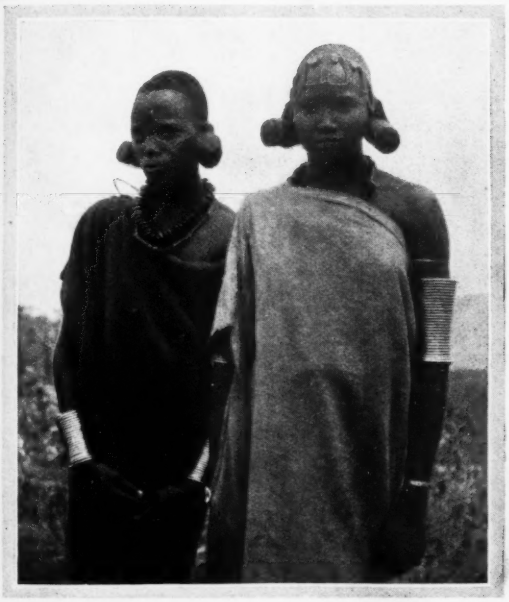

DOROBO WOMEN IN KENYA.

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# PRACTICAL TELEVISION

## *By* E. T. LARNER

Engineering Department, G.P.O., London; Associate of the Institution of Electrical Engineers; formerly Lecturer in Electrical Engineering at the L.C.C. Hackney Institute. Author of "Radio and High-Frequency Currents," etc.

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A preliminary study of essential features such as the light sensitiveness of elements like selenium, the utilization of imponderable bodies like the cathode rays, the construction and performance of light sensitive valves (or photo-electric cells) and their applications in television, is discussed before a detailed description of any television system is given. Although Mr. Baird's apparatus must be regarded as a mechanical device, there is a necessary application of certain laws and phenomena belonging to the realm of physics to be noted in following out the descriptive account of the construction of the apparatus. These collateral studies are introduced and discussed in plain language. The optical theory has also been simply explained.

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# DISCOVERY

A Monthly Popular Journal of Knowledge

Vol. IX. No. 104. AUGUST, 1928. PRICE 1s. NET

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## Editorial Notes.

A NOTABLE event in the study of cancer was recorded last month at the International Conference on Cancer, by Dr. James Murphy of New York and Dr. Archibald Leitch of the London Cancer Hospital. The result of certain experiments on chickens suggests to them the presence in normal tissues of a "growth substance," which acts as an agent in causing tumours when injected into other chickens. Whether such tumours are true cancers was at first doubtful, but their resemblance is now apparently agreed. Dr. Leitch explained the activity of the growth substance as being due to its unlocking from the healthy cells their own natural growth substance, thus transforming them into tumour cells. That is to say, a tumour is formed from normal tissue cells when these are stimulated in a particular way and by a particular chemical substance. The ferment-like nature of the principle, in this new opinion, has been conclusively established. The theory of Gye and Barnard that cancer is due to a virus is held to be discredited by a test experiment, in which the tumour agent was produced from materials which did not contain a virus. Every discovery in regard to cancer, however, confirms its complex nature, and a combination of factors is by no means improbable. But there will be general agreement with Dr. Leitch's conclusion—and general congratulation—that "the 'growth substance' which has been sought so long in malignant growths may now be within the range of experimental investigation."

* * * * *

To readers of *Discovery* the pronouncement that the agent producing cancer is probably of a ferment-like nature has special interest. For more than a year ago Sir Oliver Lodge contributed to our columns the suggestion that the cause of cancer might resemble catalysis, in that possibly the balance in the tissues was upset by such a chemical agent. Sir Oliver cited the abnormal behaviour of a tungsten lamp-filament when the bulb contains even a trace of moisture: the balance of the gases in the bulb is upset by the moisture which "serves as a stimulus, promoting an action that, once started, continues rapidly of itself, but that would not be able to begin without its outside assistance." The moisture tends to remove the tungsten from the hotter part of the filament and pile it up in another, so that by the growth in one place and the wastage in another, the filament in a short time is destroyed. "The suggestion, then," Sir Oliver wrote, "is that this sort of process that goes on in a lamp, *without any vital organisms or microbes but by the purely chemical activity* of a catalytic agent, may conceivably under certain circumstances go on in the human body." The italics in this quotation are ours; for while, of course, Dr. Murphy had long been at work when these words were published, they illustrate how the physicist and biologist may arrive independently at similar reasoning. Sir Oliver Lodge's article in *Discovery* certainly justified its modest conclusion that "sometimes a hint even from a branch of science outside medicine may be of possible use."

* * * * *

More than a month has elapsed since Captain Amundsen flew from Tromsö to join in the search for General Nobile—since happily rescued—and there is now little hope for his safety. In an appreciation from Professor Gregory, which we publish on another page, the suggestion is made that the lost explorer may be stranded in an isolated part of the Spitsbergen coast: his graphic account of earlier expeditions certainly justifies our contributor's conclusion that should some such plight have occurred, Amundsen, if anyone,can be relied on to make his way out again. So much has been written in the newspapers about the *Italia* that we shall not add to the comments on

the circumstances of General Nobile's rescue. Amundsen himself had at one time bitterly quarrelled with the Italian airman, yet had generously put aside all grievance in going to his aid; and certainly Amundsen would resent the international ill-feeling aroused by another epic of sacrifice, the death of Dr. Malmgren, whose bravery has been justly compared with that of Captain Oates during the Scott expedition. In echoing Professor Gregory's hope that Amundsen may still be alive, we may express our tribute no less to Norway than to Sweden and Italy for their noble contributions to polar research.

* * * * *

On the same day that a letter in *The Times* described the recognition of business training at American universities as a new movement, it happened that the *Evening Standard* reprinted from its issue of a hundred years previously, an extract which showed this important question to be an old one. Speaking at a dinner given in his honour in June, 1828, the Duke of Wellington said (amid "loud applause"), that although he was not a university man himself, he recognized that education could not but be of advantage if properly applied to any career. The suggestion advanced in Dr. James Bowie's letter was that a university education is of little use in business unless it has been directed into specific technical channels; and he prescribed as his alternative a "general education to matriculation standard as a minimum, followed by at least two years' instruction in industrial administration, with intervening periods spent in actual business." In order perhaps to forestall the criticism that as Director of Industrial Administration in the Manchester College of Technology he would naturally prefer such a course, Dr. Bowie proceeded to quote in his favour the Balfour committee report, that business training in the universities is now quite certainly the largest tendency in America. Those, however, who are intimate with academic circles there will have observed an equally strong reaction to this movement.

* * * * *

To recognize that the question chiefly turns on what is the true function of a university does not detract from its importance to industry. Indeed, in the interests of industry itself it will surely be a sad day when the traditional function of the English universities is given second place to technical training. Technical ability is always needed, but what appear to be even more wanted to-day are breadth of mind and a sense of proportion. These faculties may often be acquired through other channels, but they can certainly be obtained from the period for disinterested study and reflection which the years at our older universities afford. A knowledge of routine may usually be acquired afterwards, provided a methodical approach to studies has been learned in even small measure at the university, yet if the business sense is altogether lacking, no amount of special training will inculcate it. It is obviously true, as Dr. Bowie says, that goodwill must depend on efficient management. But if efficiency alone rather than judgment and ability to deal with men is to be the future criterion of our business life, we shall fast lose those traditions which have hitherto distinguished it from the more mechanical and less personal atmosphere of American industry.

* * * * *

This month we publish some notes and articles of travel interest, as many readers will be on holiday by the time this number is available. Our next number will, as usual, be devoted to the British Association, to coincide with the meeting in Glasgow at the beginning of September. As in previous years, some account will be given of the Association programme and several articles on current problems are due for inclusion. Arrangements have been made whereby members attending the meeting may obtain copies, and we confidently ask the fullest support from our readers in making this annual "special number" as widely known as possible. A specimen copy of *Discovery* will always be gladly sent on request.

* * * * *

A satisfactory outcome has followed the complaint voiced by *Nature* in regard to films brought into this country for scientific purposes. Disappointment was caused at a meeting of the British Association by the exclusion of a film of Chilian and Peruvian birds with which Mr. R. C. Murphy, of the American Museum of Natural History, had intended to illustrate a lecture. This year two similar incidents again occurred. Mr. Beebe, the eminent naturalist, was obliged to pay full duty and Mr. Wright, the distinguished American astronomer who wished to use a film to illustrate a lecture before the Royal Astronomical Society, not only had to pay duty on his film, but was also put to a good deal of trouble by the Customs authorities. Accordingly, the Association of Scientific Workers drew attention to the matter in Government quarters, and a decision has just been reached to allow the exemption of scientific films from duty. The question of their preparation also deserves special attention. We know of one leading British photographer who formerly developed the films of an American museum working in Egypt, but owing to the duties British industry has lost a large revenue from this source.

# Wireless in Mineral Prospecting

By F. J. North, D.Sc., F.G.S.

*Department of Geology, National Museum of Wales.*

*Considerable success is now being obtained with the use of wireless for detecting minerals, mainly as the result of research in the United States. Many details have still to be worked out before this new process can be generally employed by surveyors. Special study of geophysical methods will be undertaken in Australia.*

SINCE the days when mining for metals first commenced, there has always been an incentive to the discovery of methods for detecting ore-bodies that give no surface indication of their existence. Some have professed to do this by means of the divining-rod, but even as far back as 1556 George Agricola, whose books were, for more than two centuries, the world's standard works upon mining and metallurgy, dismissed the divining-rod as being useless and unnecessary. After a careful examination of the claims made for it, he came to the conclusion that no ore had ever been found by its means that the miner would not have discovered on account of "the natural indications of the veins which he can see for himself without the help of twigs."

Later on, when other methods based upon the physical properties of matter were introduced—geophysical methods as they are called—they, too, were at first regarded with suspicion as being of the same order as the discredited hazel twig. This, however, is by no means the case, because they are based upon natural laws relating to properties such as the gravity or density of bodies, or to their reaction to magnetism and electricity. Before proceeding to discuss wireless methods of surveying it may be well to outline briefly the principles underlying the application of geophysical methods in general.

## Research in Australia.

Attention has recently been directed to such methods of surveying by an arrangement between the Australian Government and the Empire Marketing Board, whereby a special study of the subject will be undertaken in Australia. The nature and arrangement of the rocks of the earth's crust can be ascertained by these methods without first obtaining direct access to them by excavations and borings [3]*.

Metallic ores sometimes occur in veins or lodes that penetrate the rocks of the earth's crust as relatively thin wall-like masses (Fig. 1A), or the occurrences may be irregular in shape and sporadic in distribution (Fig. 1B). The formation of veins and lodes is subsequent to that of the rocks in which they occur; they do not of necessity bear any definite relation to the original structural features of those rocks (for example, in the case of rocks that accumulated as sediments, the layers in which they were deposited), but they often occupy fissures, such as joints or faults that have been widened because the material on either side of the fissures has been dissolved away, or because of movements in the earth's crust.

## Geological Factors.

The prevailing directions of the joints and faults in any region are usually related to the disturbances to which its rocks have been subjected. Owing to the removal by atmospheric weathering (denudation) of the material that may once have covered them, the edges of veins and lodes usually appear at the surface, and the discovery of their position and of their relation to the enclosing rocks therefore depends to a large extent upon a proper appreciation of the geological structure of the area in which they occur.

The location of irregular ore bodies is more difficult. They may bear a definite relation to the arrangement of the rocks among which they occur, but they may swell out or die away according to no apparent system. Further, while there are often signs that would indicate to an experienced miner, who had come to the end of an ore-body, in which way he should go to reach the next, there is usually nothing to show whether another mass does actually exist, and if it does, how far away it is, or what will be its size. It may also happen that owing to the stage reached by denudation in the district concerned, there may be no surface indication whatever of the existence of an ore-body, and nothing to indicate its size and position, even if the nature and arrangement of the rocks are such that one may be expected to occur. This also applies to lodes when, as is sometimes the case, the surface of the rocks in which they occur is covered by a considerable thickness of superficial deposits, like those present in regions that were covered by ice during the last great Ice Age (Fig. 1C).

* Numbers in brackets relate to list of references on page 243.

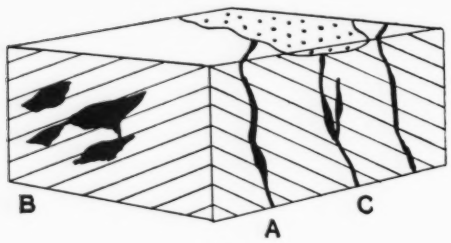


FIG. 1.
HOW ORE BODIES OCCUR.
(A) A vein or lode which reaches the surface; (C) A lode, not exposed at the surface on account of a covering of "drift" deposits; (B) Irregular ore masses, of which there are no surface indications.

In the methods employed to determine the position and extent of hidden ore-bodies (or the juxtaposition of different kinds of rock beneath the surface, for the principles involved are the same), advantage is taken of several properties that can be detected at a distance. Some methods relate to the attractive force of gravity, others to the magnetic or electric properties of bodies by reason of which they may generate or transmit magnetic force or electric currents.

The gravity methods depend upon the fact that the attractive force of a body is related to its density—they employ the principles upon which Nevil Maskelyne conducted his pendulum experiments at Schiehallion in Perthshire (1775), and determined the weight of the earth, and upon which Henry Cavendish (in 1798) based his determination of its weight by measuring the twisting or torsion, due to gravity attraction, of a wire from which weights were suspended. One of the most successful modern appliances for geophysical surveying—the Eötvös torsion balance*—employs the principle of the Cavendish torsion experiment.

The magnetic methods depend for their operation upon the fact that the earth acts as a large magnet; a magnetized needle, suspended in a horizontal position (Fig. 2A) normally points to the magnetic north, while a similar needle suspended so as to swing in a vertical plane, points or "dips" towards the ground (Fig. 2B). The angle by which the horizontal needle deviates from the direction of the true north, and the angle of dip of the vertical needle, are known for many parts of the earth, and in the neighbourhood of an ore-body consisting of material with magnetic properties,both needles will deviate from the direction they would normally assume at the place in question. In this way, the site and approximate boundaries of such a mass can be determined, because by joining up on a map all places where the deviation of the compass needle is the same (giving isogonic lines†), the presence and shape of a buried mass will be indicated by the deflection of the lines from the normal for the district. By connecting points of equal dip of the vertical needle (giving isoclinic lines, or lines of equal inclination) the relative intensity of the magnetic attraction exerted by the concealed body can also be gauged, and this information throws light upon its nature and its depth beneath the surface.

Several methods of prospecting take advantage of differences in the electrical conductivity of rocks; for example, electricity from a portable generator is allowed to pass between two electrodes, usually in the form of rods stuck into the ground, and the currents passing through the rocks are detected by means of

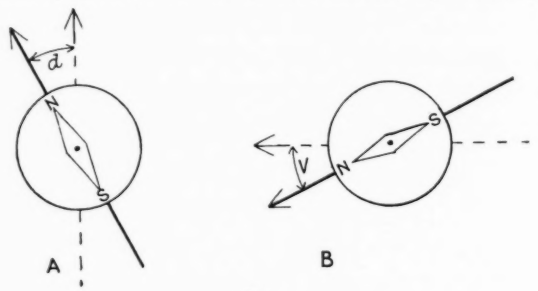


FIG. 2.
INFLUENCES OF ORES ON A COMPASS.
The compass needle (A) deviates from the true north by an angle (d), and a magnetic needle swinging in a vertical plane, (B) Points downward or "dips" at an angle (v). The angles d and v vary from place to place, and are affected by the presence of a magnetic body.

two other rods connected to a sensitive galvanometer. The object is to trace all the spots of equal electric pressure or "potential," and by connecting them, to indicate upon a map, lines of equal potential—"equipotential" lines—corresponding to the isogonal lines and the isoclinal lines of the magnetic methods.

If the material in which the electric field has been produced is of equal conductivity throughout, the flow of the current will be regular, and so will the equipotential lines, which, connecting points of equal electrical pressure, will be at right angles to those representing the direction of current flow (Fig. 3A). Where, however, bodies of different conductivities meet, the equipotential lines will be bent, coming together above bad conductors (Fig. 3C), and spreading out above good ones (Fig. 3B). In this way, the manner in which the equipotential lines deviate from what would be expected if no differently conducting material were present, indicates, when properly

* See *Discovery*, Vol. VI, p. 141.

† Isogonic lines, or lines of equal angles, correspond to the contour lines on a map, which are lines of equal elevation, and to isobars on weather charts, which are lines of equal barometric pressure.

interpreted, the existence and position of an ore-body.

Magnetic and electrical methods of prospecting were greatly advanced as a result of the research carried out during the War on the detection of submarines. A submarine in motion could be detected because of its effect upon the water or by the noise of its propellers, but a submerged submarine at rest may also be found, as it is similar in some of its properties to a buried ore-body. Being largely of steel, it affects the magnetic needle ; consisting of more than one kind of metal immersed in sea-water, it acts like an electric battery and generates electricity ; and being a conductor of electricity, currents could be " induced " in it. By taking advantage of these properties the detection of stationary submarines was developed into a fine art, and since the principles involved are similar, magnetic and electrical methods of prospecting have made great progress in the last few years, especially in Sweden [1].

It is only natural that as wireless electrical communication passed from the experimental to the practical stage, attempts should be made to apply " wireless " to geophysical surveying, and most of the work in this connexion seems to have been done in North America. The reason for this is that, like all other geophysical methods, it supplements, but cannot entirely replace, exploration based on geological principles. In this country the metalliferous areas have been so long worked and the distribution of the ore is well known, that there has not been the same inducement to introduce fresh methods of prospecting as is the case in North America, where there are vast

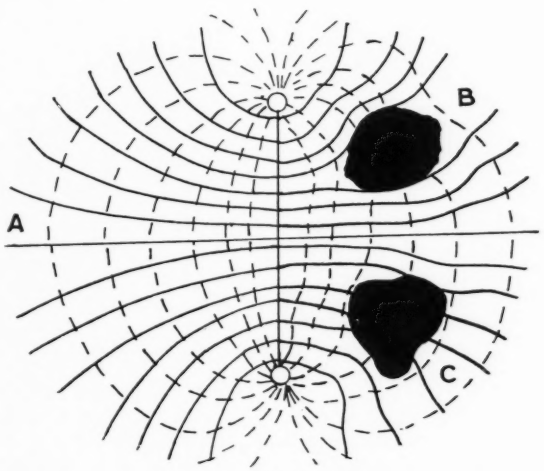


FIG. 3.
THE PATHS OF AN EARTHED CURRENT.
Diagrammatic representation of the flow of current (broken lines) through the ground between two earthed electrodes, and the lines of equal electrical pressure or equipotential lines (continuous lines). Details are given in the text.

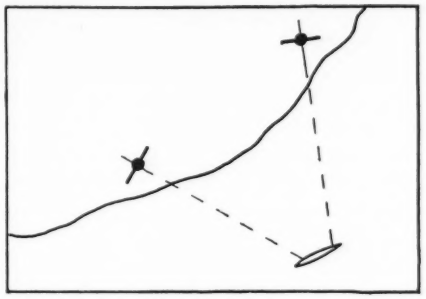

FIG. 4.
WIRELESS LOCATION OF SHIPS.
Analagous principle of the location of ships sending out wireless signals.

areas in which metalliferous deposits may be expected to occur, and of which the geological structure is practically unknown. The United States Department of Commerce has recently published a pamphlet by Drs. Eve and Keys, in which all the methods of geophysical surveying are reviewed, and the principles of the wireless methods discussed [2]. The following notes are, to some extent, based upon that pamphlet.

Wireless methods of prospecting are somewhat akin to those used in the location of ships at sea ; a coil at a coast station receives signals of maximum strength when its plane points towards a ship sending out signals, and receives signals of minimum strength when its plane is at right angles to their source (Fig. 4).

In the case of an ore body, which cannot transmit signals, the first step, as is the case in the electromagnetic methods, is to excite it by transmission from a suitable aerial ; in one of the methods that are being tried, a loop aerial is used. The waves from a vertical loop (Fig. 5A) will penetrate to an ore-body, not too deeply buried, and being re-radiated can be detected by a suitable receiving set (Fig. 5B). The latter will also receive waves passing directly through the air from the transmitting loop, and these will not only be much more powerful, but will almost certainly not be in " step " or in " phase " with those received from the ore-body. This difficulty can, however, be overcome by altering the frequency in the transmitting loop, and tuning the receiving coil until the signals received from the aerial and the ore-body are in phase.

Having made these adjustments, the signals will vary in strength according to the relation between the position of the direction-finding coil and the position of the buried body from which they have been re-radiated. They will be at a minimum when the plane of the coil points in a direction that is a resultant of two vectors (as a quantity involving both direction and magnitude is called), the one relating

to the ore and the other to the transmitting loop. In Fig. 6, each vector is represented by a straight line, the length of which indicates the relative intensity of the signals, and which points in the direction whence the signals were received. The vertical line (A) is the vector relating to the principal waves received directly from the transmitting loop, and the inclined line (B), the vector relating to the ore; the resultant direction is obtained by completing the parallelogram, and continuing the diagonal (D).

It is found that the direction-finding coil receives currents of minimum strength when its plane points in the direction of the ore-body, but below it, and if observations are taken at a number of places, the position of the ore-body is indicated. In successful experiments that have been conducted, the frequency in the transmitter varies from 19,000 to 150,000 cycles per second, and the wave-length from 2,000 to 16,000 metres.

At present there is a dearth of reliable information concerning the extent to which wireless waves can penetrate into the earth, or are affected by the nature of the rocks and by their relative wetness and dryness. A moment's reflection will enable one to realize that in railway tunnels the waves might pass along the airway or be carried by the rails. Even in deep mines, where the air passage from the shaft mouth to a chosen spot underground may be so tortuous as to preclude any possibility of the waves reaching the receiver by open channels, various conducting bodies—such as electric cables, pipes conveying air or water, and tram rails—penetrate into practically every part in which experiments could be conducted with safety.

Interesting experiments in this connexion have been conducted by Dr. A. S. Eve of the McGill University, Montreal, in collaboration with the United States

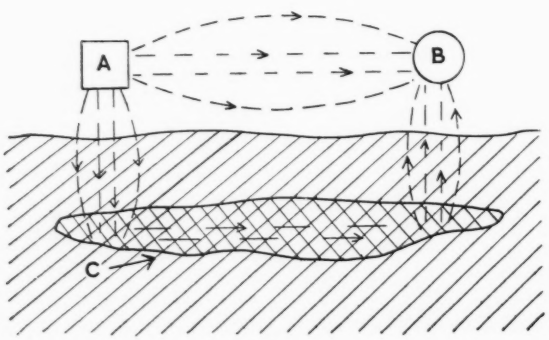


FIG. 5.
PRINCIPLE OF WIRELESS PROSPECTING.

Signals sent from a station A are received at B, in part directly through the air, and in part by way of a concealed ore-body (C), the electrical conductivity of which differs from that of the surrounding rocks. (*After Eve and Keys.*)

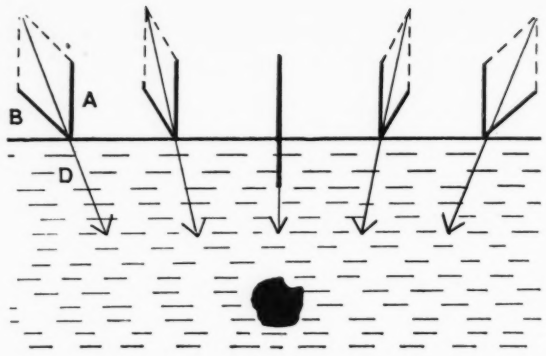


FIG. 6.
A PRACTICAL EXAMPLE.

Diagram illustrating the location of an ore-body by means of a number of observations on the direction and intensity of wireless signals, sent and received by the method indicated in Fig. 5. (A) The vector relating to signals received directly by wireless through the air; and (B) the vector relating to signals received partly by way of the conducting ore-body. (*After Eve and Keys.*)

Bureau of Mines. Dr. Eve, working in a long railway tunnel at Montreal, found that wireless signals of short wave-length (40 metres) could not be detected at a comparatively short distance within the tunnel, although broadcast waves (400 metres) were detected in the middle of the tunnel beneath a cover of 700 feet of rock, and waves of 10,000 metres length were detected much more readily. In such experiments the possibility that the transmission was assisted by the electric wires and rails in the tunnel has to be considered, but in any case the short waves penetrated for a short distance only.

The effect of moisture in the rocks has also to be taken into account, because experiments with submarines have shown that wireless waves do not penetrate very far into sea water.

A few months later Dr. Eve and others conducted further tests in the famous Caribou Mine, Colorado, using a nine-valve wireless set. At a depth of 220 feet, in a tunnel free from wire, rails, and pipes, a concert broadcast from Denver, more than fifty miles away, was clearly received. At a depth of 550 feet poor reception was recorded on an occasion when equally poor reception was experienced at the surface; but a concert was clearly received at that depth, at the end of a passage 80 feet from any metalliferous conductor, when the reception was good above ground. Here, again, the possibility of the wireless waves having come by way of air channels and having been influenced by metallic conductors has to be considered, but the path to the spot where the experiments were made was very tortuous and the signals were received at maximum strength when the loop faced, not along tunnels or towards near-by conductors in the mine, but in the direction of Denver.

The experiments seem to indicate that wireless waves which will penetrate 50 or 60 feet in a good conductor like sea water will penetrate much further —at least up to 500 or 600 feet—in poor conductors, such as the average rocks of the earth's crust when they are relatively dry.

Another matter about which, at present, doubt exists, is the extent to which the phenomenon is one of real re-radiation of wireless rays, or one of induction —that is to say, the production of an electro-motive force in one electric circuit through the agency of another, without any direct electrical connexion between the two, which is the working principle of many important appliances such as the transformer. This possibility is rendered more likely by the fact that in any places where tests can be undertaken, or in any ore-bodies that miners can hope to reach, the distance beneath the surface is comparatively small compared with the wave-lengths involved.

In the foregoing pages sufficient has been written to indicate the general principles upon which some of of the geophysical methods of surveying are based, and to show that although their object is to detect materials without actually coming into contact with them, they rest upon a sound scientific basis. Each of the methods has its own sphere of usefulness and its own limitations; for example, the magnetic and electrical methods appear to be most successful when dealing with the metallic ore-bodies, and the gravity methods in the case of non-metallic materials such as oil, salt, and coal. But in conjunction with geological knowledge there can be no doubt that geophysical methods can be used successfully in the exploration of the earth's crust, and will prove of the utmost value to not only the prospector but also to the physicist and the geologist.

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# Raold Amundsen: An Appreciation.

**By J. W. Gregory, D.Sc., F.R.S.**

*Professor of Geology in the University of Glasgow.*

*Without detracting from the hope that Amundsen may yet be found alive—as we go to press there is still no news—we feel the moment appropriate to review the career of this great Norwegian. Our contributor, Professor Gregory, has himself explored in the polar regions; he does not shirk to deal frankly with the famous Curzon controversy, and he concludes with an interesting suggestion as to Amundsen's present plight.*

RAOLD AMUNDSEN will doubtless live in the annals of polar exploration as one of the outstanding figures, owing to the genius and insight which enabled him to carry through successfully a unique series of Arctic and Antarctic adventures. He was born on 16th July, 1872, the son of a Norwegian shipowner. He began the study of medicine at Oslo University, but he early felt the call of the sea and of the Arctic, and went to sea in 1894. He was one of those young Norwegians whom the national sentiment, as Eva Nansen's song has it,

> Gave them the wish to wander;
> To leave our shores and turn their prow
> Towards night and perils yonder.
> Thou pointed'st to the open sea,
> The long cape was thy finger;
> The white sail wings they got from thee,
> Thou cans't not bid them linger!

In obedience to that impulse Amundsen devoted his life to polar research, and spent it in a series of circum-polar journeys which are unrivalled for their extent and uniform success.

Amundsen's first share in polar exploration was as lieutenant in the Belgian Antarctic Expedition under de Gerlache, which in 1897-9 made important additions to knowledge of the archipelagoes south of the South Atlantic. In 1903 he started on his first independent expedition, in the *Gjöa*, a sloop of 47 tons with an auxiliary motor engine of 39 horse-power. He had six companions. They crossed to Greenland, entered Lancaster Sound, and were frozen in for two years in Gjöa Harbour in King William's Land; there they made many useful meteorological and magnetic observations, charted some of the coasts, and redetermined the position of the North Magnetic Pole. In August, 1905, the *Gjöa* was set free but was frozen in again off King Point, and after a third winter in the ice was released again on 11th July, 1906, and next

month entered the Pacific. The *Gjöa* is the only vessel that has achieved the North-West Passage.

In 1910 Amundsen started on his most famous journey. He sailed from Norway in Nansen's vessel, the *Fram*, ostensibly to take her *via* the Atlantic and Pacific to Behring Strait, and thence drift across the North Pole. He had not, however, an adequate equipment for that project, and to secure the necessary funds for it he halted on the way in the Ross Sea, wintered on the edge of Ross' Great Ice Barrier, and after a swift inadventurous sledge journey reached the South Pole on 16th December, 1911, before the British Expedition under Scott. Amundsen with his usual thoroughness made a series of traverses and set up signals around the Pole, so as to avoid any chance of question as to his having attained the Pole. The remarkable feature in this journey was the ease with which it was made, in contrast to the strenuous efforts by which Scott and his party reached the South Pole and to the tragedy of the return. The feeling that Scott's intense disappointment at having been forestalled contributed to the disaster, led to some expressions of resentment at Amundsen's having gained the South Pole as a side-trip in his proposed trans-Arctic drift ; but the general feeling in this country was of genuine admiration for one of the masterpieces of polar travel.

### First Air Experiments.

Amundsen's expedition to the South Pole secured him the funds for further enterprise. In 1918, in a new vessel, the *Maud*, he sailed *via* the Pacific for Behring Strait, intending to drift across the Arctic Ocean. He hoped, by entering the pack further east than the *Fram*, to be carried nearer the Pole than the route of Nansen and Sverdrup. But the drift of the ice was too irregular and the voyage failed in its main purpose.

While at Seattle on the voyage north with the *Maud* Amundsen heard of the success of an all-aluminium aeroplane ; and with characteristic insight, he realized that this machine could withstand any degree of cold and should render possible in circum-polar work what was still impossible. Amundsen at once began experiments with aeroplanes, but they were costly failures.

He took two aeroplanes on the *Maud*, but they both crashed. Amundsen, however, learnt much from them ; he persisted in his efforts and became the pioneer in polar aerial exploration. A donation of 85,000 dollars from J. W. Ellsworth provided Amundsen with two hydroplanes, and in 1925 he tried to fly from Spitsbergen to the North Pole. About 100 miles from it he had to descend in fog ; the machines sank into the slush on the floes, and only after a month's strenuous labour—in the intervals of which he sounded the sea beneath and by finding a depth of over 11,000 feet showed that there was probably no land at the Pole—during a day of severe frost one of the two machines was freed, and by abandoning all their stores they made the flight of 550 miles back to Spitsbergen. The party had been abandoned as lost, but they met a sloop which towed the hydroplane back to safety.

With characteristic tenacity Amundsen next year tried again, in an Italian built airship, the *Norge*. By a triumphant voyage of 2,700 miles in 71 hours he twice circumnavigated the Pole, crossed the Arctic Ocean to Point Barrow in Alaska, and landed at Teller in the Behring Sea.

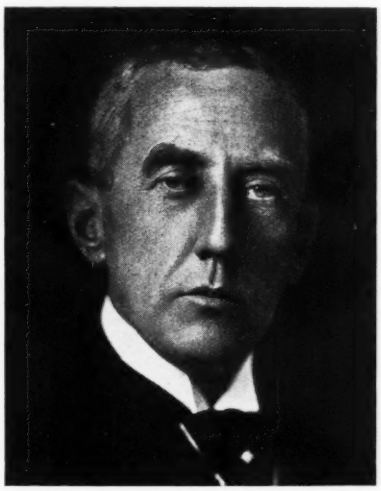
Amundsen is no doubt inferior to his compatriot Nansen as a scientific geographer, and though he has contributed largely to knowledge of the Arctic regions, his work was inspired by his passion for Arctic travel and his success was due to the insight and imagination which enabled him to select appropriate methods and conquer the special difficulties.

Amundsen's greatest gift was his mastery of the technique of circum-polar travel. He chose methods which enabled him to carry through with ease journeys which otherwise required exhausting efforts or proved impossible. Though he narrowly escaped in 1925, he got all his men back safely, and showed that the hydroplane cannot be trusted on a frozen sea. He showed great originality in designing equipment, as in his solar-compass, which, as made by Goerz, enables an aeroplane to be steered where the magnetic compass is useless owing to proximity to the magnetic pole. Amundsen's prevision in preparation and skill in the selection of methods amounted to genius ; and that capacity, combined with his powers as a leader and in securing the confidence of his companions, gained him his unfailing success.

Amundsen, in fact, suffered in popular reputation by the skill with which he performed with apparent ease feats which others achieved at the cost of heroic endurance and disaster. Franklin gained immortality by the cannibalism of his starving men on the Mackenzie River and the loss of the whole of his last expedition. How many people remember the names of Dease and Simpson, the two agents of the Hudson Bay Company who quietly did what Franklin had failed to do, or of John Rae, the young doctor who by first wintering in the Arctic with only a summer marching equipment, found the first evidence of Franklin's fate ?

By the intuitions which enabled Amundsen to discover how dangers could be avoided and the way made practicable he, in the sphere of current polar work, may be compared to Captain Cook who rendered possible long voyages in the equatorial and southern seas. As a man and a leader of men, he has most resemblance, amongst contemporary explorers, to Shackleton.

Amundsen's last connexion with British geography was deeply regrettable. He was in many ways like an Elizabethan navigator, and was likely to treat what he regarded as sarcastic disparagement in the spirit of Drake and Frobisher's quarrel, after the Armada was over, about Don Pedro de Valdes' galleon. In an autobiographical chapter he revealed his profound resentment at remarks made by Lord Curzon, who as President of the Royal Geographical Society was chairman at his lecture in the Albert Hall on his South Pole expedition. As Lord Curzon was dead, the Council of the Society felt bound to repudiate the charge of rudeness to their distinguished guest. Amundsen's memory of the facts was defective and his complaint was blunt, and as the impression on him was ineradicable his name was removed from the list of Honorary Fellows of the Society.



RAOLD AMUNDSEN. *Swaine*

When judging of the incident I cannot but remember how Lord Curzon, after his election as Lord Rector of Glasgow University, infuriated his admiring and enthusiastic constituents and how, in one of the select gatherings to welcome him, he mortified a group of bystanders by a tactless remark to an acquaintance made in simple absent-minded oblivion that it would be heard by all those around him. In my own limited relations and correspondence with Lord Curzon I always found him charmingly courteous and singularly modest in his judgment; but such was not his reputation. He was popularly credited with unique powers of exasperation, due to his occasional awkwardness of manner and his unlucky habit of thinking aloud. Some of his critics in India declared that he was only more riling when speaking in friendly patronage when he was trying to be playfully facetious. Chaffing a man in a foreign language is notoriously liable to misunderstanding; and Amundsen's deep-rooted annoyance was probably due to his confused recollection of jocular remarks made in conversation as well as with the speech as chairman. But as Amundsen made no protest shortly afterwards, it was no use expressing his resentment when twenty-five years brooding had exaggerated the fancied insult and death had prevented the simple solution of an assurance from Lord Curzon that his remarks had been utterly misunderstood. Is there any doubt that Lord Curzon would have been Premier, and probably the greatest Premier of his time, if his trail had not been littered with men like Amundsen suffering acutely from his powers of unwitting exasperation?

Amundsen's own interest in polar exploring was more in the excitement of the work than in the results. He felt that "Things won are done; joy's soul lies in the doing." He has not the abiding interest in geographical problems of Nansen, but loves Arctic travel for its own sake. Hence it was in accordance with his natural instincts to join in the rescue of the crew of the *Italia*. He doubtless volunteered the more readily owing to his quarrel with General Nobile during the former flight, and he chivalrously, in spite of his fifty-six years of age, joined in the quest in the first machine available. He left Tromsoe on 18th June in a French hydroplane, and has not been heard of since. Repeated disasters have happened in the efforts at aerial navigation in the Arctic, beginning with the disappearance of Andrée in 1897, owing to the failure of devices designed in temperate climates to stand prolonged reliability trials under Arctic conditions. The French hydroplane has apparently failed like Amundsen's two machines in 1925. But it must have had adequate fuel to carry it to any part of Spitsbergen, and it may have landed, crippled, in one of the many bays on the eastern coasts.

Hence there is still good hopes for his safety. He was more than a month overdue in 1925; and full confidence may be felt in his power, if he has landed in some remote part of Spitsbergen, to turn to account the resources of the country, and make his way in the autumn to the settlements on the western coast. But if fate has been cruel and Amundsen has perished in his gallant effort to rescue the survivors of the *Italia*, his sacrifice will be a noble ending to a great career.

*

# The Most Northerly Town in the World.

By John Andrews.

*The writer has just returned from a four thousand miles cruise to Hammerfest, near the North Cape, which afforded new and varied interests. On this route may be seen the summer quarters of the Lapps, one of the few peoples who still retain their primitive dress and customs.*

NORWAY to-day is making every effort to attract her share of the British tourists who since the war have flocked in increasing numbers to the continent. Fortunately for those who avoid the beaten track the country is still unaffected by the standardization which elsewhere has followed this traffic, but as the Norwegians are closely akin to the British, the novel conditions can be enjoyed without the discomforts of other lesser known countries in the south. Next month will see the close of the National Exhibition, held during the summer in Bergen for the joint purpose of promoting trade and of advertising the hotel and travel services which Norway has to offer.

VIEW OF THE TOWN AND HARBOUR.

Almost every house in Hammerfest is built of wood. Across the harbour is seen a tongue of land, the Fuglenes, which marks the north end of the meridian 25° 21′.

Just as the North Cape was "unknown" to Longfellow—

> And then uprose before me,
> Upon the water's edge,
> The huge and haggard shape
> Of that unknown North Cape,
> Whose form is like a wedge.

—it is still not often visited, although in 1802 it had formed the subject of a travel book published in London. The steamer* from Bergen steers its northward course as much as possible behind the coastal islands, and in reaching the final port of call, Kirkenes, it travels round Magerö, where the North Cape is situated. Fifty miles below the Cape, itself the peak of Europe, is Hammerfest—the most northerly town in the world.

As the steamer nears the quay there may be seen near-by two groups of fenced-in trees, which the Norwegians proudly term the world's most northern "park." The trees in no case are more than ten feet high and show signs of frequent renewal, some of their number being replaced every spring despite the screens which in winter are erected to protect them. On the other side of the Sadlen—a hill of saddle shape ascending steeply behind the town—a small copse of birch trees rivals the park, and a new private residence now boasts a few shrubs in its carefully tended garden.

Across the harbour is the Fuglenes, the cape where in 1823 Sir Edward Sabine made his historic experiments with the pendulum. A granite column mounted with a globe marks at this spot the north end of the meridian 25° 21′ long., which was traced from the Arctic Ocean to Ismail on the Danube, by way of Norway, Sweden, and Russia. This tremendous labour was carried out by Royal command in the three countries during the period 1816-1852.

From 14th May to 29th July the sun never sets at Hammerfest, and likewise it is not visible at all from 21st November to 23rd January. It is therefore not surprising that tuberculosis is prevalent among the fishermen inhabitants—their wooden houses, in many cases scarcely more than huts, have closed windows for the greater part of the year, and the sanitary conditions also are primitive. A fine new hospital—not yet opened—overlooks the harbour, and is a reminder that to the early nursing efforts of some visiting Sisters who founded a Catholic community, Hammerfest owes the distinction of having a Roman Catholic church, although its population is but three thousand—Norway is overwhelmingly Protestant.

The northern outlook from the Fuglenes is uninterrupted by islands and affords an excellent view of the Midnight Sun, as it hovers as a stationary ball above the horizon, at its lowest angle, before

* The voyage here described was made in the *Kong Harald* and the *Haakon VII*, both vessels in the service of the B. & N. Norwegian Royal Mail Line.

again mounting in the sky. The North Cape itself is perhaps the most renowned point for observation, but the sun may be seen on many nights while the steamer is travelling within the Arctic Circle. Frequently the sun itself is obscured by coastal mountains or clouds, yet in such cases most wonderful colourings are effected in the sky. The view which the writer enjoyed best was at Tromsö, on the southward journey; after an unsettled day that had opened with rain and mist, the sun at midnight blazed forth from behind some deep mauve clouds and enveloped the white wooden buildings of the town in a rich orange glow.

Tromsö was at this time the headquarters of the Italian airmen who were among those searching the southern Arctic for Amundsen. As it rested on the harbour waters, their seaplane was in quaint contrast to the fishing boats, and it emphasized the keen anxiety felt in the fate of the great explorer, of whom all Norwegians are justly proud. Tromsö has been the base of many polar expeditions, as well as of Arctic hunters of seal, walrus and whale, and in the interesting local museum a section is also devoted to Lapp exhibits. Off the Norwegian coast itself, whaling is legally forbidden, as the whales are helpful to the fishermen in driving shoals of fish into the shore waters.

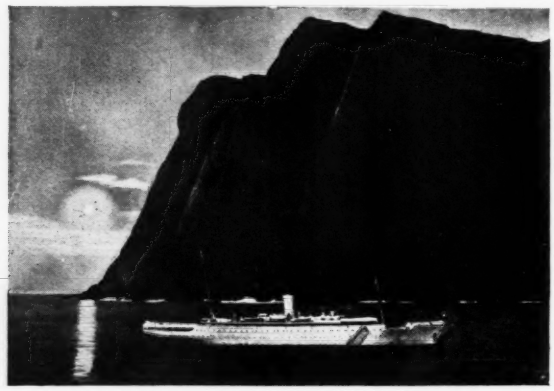
THE "PARK" AT HAMMERFEST.

The trees in the fenced enclosure (on the left) are tended with great care, as they are the most northerly grown in the world. Frequent replanting is necessary

In sharp contrast with the bleak character of Hammerfest and other Arctic ports of call is Molde, the "City of the Roses." With honeysuckle and other flowers the roses flourish here, and across the fjord a panorama of forty-six mountain peaks presents one of the grandest views in Norway. But perhaps the most unusual of the islands passed on the cruise is Torghatten, where a natural tunnel leads through the rock. Some of the larger steamers stop at this point to allow passengers to climb the mountain. The tunnel is over two hundred feet high and as wide as the nave of a cathedral, yet from the sea it appears no larger than a keyhole. Another natural feature that has an air of weirdness is afforded by the Trold (or "witch") Fjord, where the steamer heads for an apparently solid wall of rock; but soon a narrow channel is revealed, leading into a deep pool that forms a pocket in the mountain side. Here the cliffs give back an echo, when the ship's whistle is sounded, as if the *trolds* were mocking—from this the fjord takes its name. The peaks of the Lofoten mountains are seen towering above, as the steamer emerges again into the wider waters of the Raftsund.

The only industry at Hammerfest is fishing, and the harbour is the second centre for the fleets which set out each year for the Polar Seas—the most important is Tromsö, where a big trade in furs is also carried on. The unequalled scope for fishing which the sheltered coast provides has made the Norse a race of sailors, and it is estimated that nearly half of the four millions which make up their number have become scattered over the globe. Emigration to the United States accounts for a considerable proportion—Chicago is jocularly termed the "second largest town in Norway"—but there are colonies in many ports, especially in Canada, South Africa and Australia. During the war the Norwegian fishing trade experienced enormous prosperity owing to the rival demands for this neutral supply of foodstuffs; a year after the Armistice, at Haugesund, for example, there were still to be seen thousands of barrels of putrified herrings, which had first been ordered by Germany but afterwards bought for a higher price by England, although transportation from Norway was never undertaken.

Fishing is accomplished during the winter months, and at this time of year—the voyage here described was made in July—the traveller will see the drying and packing processes in operation at every village. In the more southern ports vast quantities of haddock are undergoing treatment: after gutting and cleaning, the fish are stacked in octagonal piles and covered with wooden lids. In the storing yards the piles are closely placed, but along the shore they are to be seen arranged at intervals, for better exposure to the sun, and resembling groups of beehives or haystacks. If space allows the fish are sometimes spread out singly on the ground during the day, to be piled and covered again at night. For smaller fish other methods are employed, and in the northern villages the cod, for example, are tied in pairs and hung over poles supported on trestles. Many rows are staked out



THE MIDNIGHT SUN BEYOND THE NORTH CAPE.

On clear evenings an uninterrupted view is obtained from "the huge and haggard shape" which rises vertically out of the sea. The motor yacht *Stellar Polaris* seen in the foreground clearly indicates the proportions of the Cape.

on the beach and some of the drying areas cover hundreds of square yards. The wind no less than the sun is effective in drying, and afterwards the fish are packed in wooden cases for export, a large trade being done with the Mediterranean and other Catholic countries. The waste bones and fish heads are turned into guano, and in the absence of a breeze—or if the wind blows towards the shore—the noxious smell of this manufacture is overwhelming. The natives, however, are said not to notice it, so accustomed do they become to what is after all one of their staple industries.

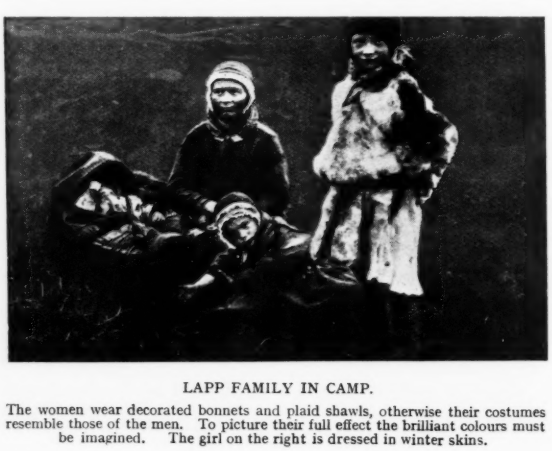
During the long cruise up the Norwegian coast, the steamer calls in twice a day—sometimes the port has twenty thousand inhabitants, at others a rowing boat comes out to take off a single passenger. There are no coastal railways and everywhere the steamer is the only link with the outer world. As the traveller cruises along—a part of that world, yet removed ever farther from it—there are two observations at least which cannot escape him.

Whatever turmoil, he reflects, may disturb the main continental countries, here in such sheltered places life goes on unchanged, in essentials just as it has done for hundreds of years. Against the rugged background its permanence is clearly defined—this universal message of Nature in less isolated places is contaminated by the disturbances nearer at hand.

Yet these fishing people in Norway, paradoxically, are so completely "westernized" that as they gather on every quayside to welcome the steamer—the girls in their silk stockings and high-heeled shoes, the men with bowlers and (in one case) in spats—they might equally be waiting for a 'bus in a London thoroughfare! This reflection is a humorous one, but however disillusioning to the artist, it does not necessarily discredit civilization. Rather, the preference for modern modes and fashions appears to reflect in their favour, though precisely why they appeal remains a mystery. Modern commerce, of course, is spreading its products to every corner of the world, and people whose lives are sheltered may find exhilaration in being "up to date." The obvious fact that bowlers are not the most harmonious hats for fishermen, perhaps strikes only the sophisticated traveller, who is all the time compensating for his greater separation from the hand-to-mouth existence. And the same ship which brings the hats to Hammerfest is also carrying a cargo of medicine, linen, and soap.

If the fishing villages are losing their native character—and the telephone and electric light, everywhere used in Norway, are contributing factors to this change—there is ample compensation in the primitive condition of the Lapps. Except perhaps for a growing trade in reindeer knives and other "souvenirs," these people remain untouched by modern influences and tend their herds in just the same way as their earliest ancestors.

In the spring there is a westerly movement to the coast, when families of Lapps bring their reindeer to the islands, both for the better pasture which they have to offer and in order that the animals may breed there. Swarms of mosquitoes, also, make life unbearable on the higher inland plains, while the migration allows the moss to grow there during the summer months. Along the shores of the northerly islands, such as Grönö, the steamer passes many isolated encampments, where in small turf huts—with a hole in the roof to let out the smoke—or in tents,



LAPP FAMILY IN CAMP.

The women wear decorated bonnets and plaid shawls, otherwise their costumes resemble those of the men. To picture their full effect the brilliant colours must be imagined. The girl on the right is dressed in winter skins.

the Lapps pass the summer. Their reindeer, which have earlier swum across from the mainland in their herds, now scatter high up the steep face of the mountains overhanging the water, and appear from the steamer like small groups of white ants. These unusual sights emphasized the value of field glasses, which in Norway are as essential to observe such details as they are useful for the general scenery. The valley at Tromsö is every year a centre for a Lapp camp, where a few dozen families make their homes and are a source of much attraction to travellers. Most of the steamers make a halt of some hours, as to reach the camp it is necessary to ferry across the harbour and there take a motor drive.

The summer dress of the Lapps—in winter they wear skins and fur—is a jacket of bright blue woollen material, woven and dyed by their native devices. The peaked cap is crowned with a bright red bobble, and round the collar and sleeves there are borders of highly coloured decorations, in red and yellow. The belt carries a hunting knife, and *komager* are worn on the feet—heel-less leather boots with curled up toes—so that the Lapp walks with a flat-footed gait. The breast portion of the jacket above the belt is used as a sack for carrying purposes, and gives the wearer the appearance of being stuffed with a pillow ; as he waddles along he resembles nothing so much as a pigeon ! The Lapps are a skilful people in their reindeer trade, and many of them acquire considerable wealth. Their status is measured by the number of reindeer possessed—trade being done in meat and skins, while the bones are carved into knives and spoons. The bigger the bobble in the cap, the more wealthy its owner.

In Norway the Lapps frequent the Province of Finnmark, paying the usual taxes to the government, and are hence locally called Finns. The Lapps are, however, distinct from the Finnlanders, who reside further eastward in Finnland itself, and their principal territory is Swedish Lapland. The policies pursued by the Norwegian and Swedish governments differ in regard to the Lapps, the former tending towards their assimilation ; thus school attendance is now compulsory in Finnmark. How long the people will remain in their primitive condition is therefore a problem which only the future can answer.

REINDEER IN SUMMER PASTURES.
At this time of year the Lapps bring the herds down to the coastal valleys, which are in marked contrast to their winter surroundings.

Much more might be written about this less familiar part of Norway, which in winter is subjected to the the rigours of the Arctic climate, yet in summer enjoys a pleasant heat and endless sunshine. It would, however, be mistaken to conclude without remarking on the fertile valleys and profuse vegetation which are characteristic of the Norwegian mainland. The coastal steamers penetrate the fjords only so far as is necessary to reach towns that are set back on such waters, but at Trondhjem, for example, a motor excursion may be undertaken through noteworthy inland scenery. The road from there to the Lerfoss waterfalls rises through richly wooded country and on the mountainside near-by, commanding a wide panorama, is now being constructed a modern hotel for tourist and winter sport service.

A QUAYSIDE PICTURE.
This shows the curious effect produced by the Lapp's practice of using the front of the jacket as a sack. The man on the right is wealthier than his companion, as he wears a larger bobble on the cap.

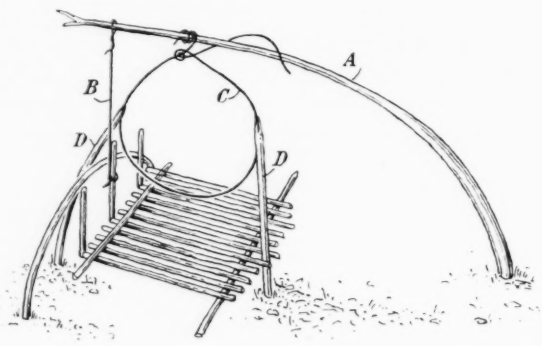
As the traveller leaves the Land of the Midnight Sun and on the southward journey comes again to lowering skies, he appreciates with Wordsworth "the cottage windows blazed through twilight gloom." But his two weeks' journey in perpetual day he will long remember.

# A Hunting Tribe of Kenya Colony.

By G. W. B. Huntingford, F.R.A.I.

*The Wandorobo are an interesting example of a hunting people now passing into the pastoral and agricultural stages simultaneously. Where the tribe came from is quite unknown, and as they are shy and suspicious of strangers, the writer was fortunate in visiting them under friendly native auspices.*

SOME twelve sections of a primitive people, who are generally called Wandorobo or Dorobo, but who call themselves Okiek, are to be found living the life of hunters in various forest regions of Kenya Colony. Of their history, manners, and customs, comparatively little is known; and I count myself very fortunate in that I was able to make friends with an influential Dorobo elder of the section which inhabits the forest region north of Tindiret Hill, some fifty miles east of Lake Victoria (about lat. 0° 5′ N.; long. 35° 25′ E.). This elder was called Kiparngetuny Arap Ng'amng'am, or "Lion-killer son of Ng'amng'am." He was chief of the Dorobo about twenty years ago, but resigned his office, since when they have had no chief at all. I told him that I wanted to see his people—they are very shy, and suspicious of strangers—and he promised to tell them I was coming. The Dorobo country is about thirty miles from where I was stationed recently in Nandi; and one day I started with a friend, the Hon. P. L. O'Brien, on a short expedition to Kipkorom, the nearest Dorobo district. With us went Choimim, the son of Arap Ng'amng'am, and some of my Nandi servants, who have dealings with the Dorobo.




A SNARE MADE OF STICKS.

When the animal treads on the platform the cord B is released, and the stick A springs up, thereby suspending the animal in the attached noose C. This is held open by the split sticks D.

There is no road to Kipkorom, and we walked along native paths. We reached our destination about 3 p.m. after walking for eight hours, and had just time to pitch our tent before a heavy storm soaked everything exposed to it. Some Dorobo had come to meet us, and one of them, a young man named Arap Kimining, volunteered to be our guide. The next day he took us through the forest, about 8,000 feet in altitude, and I met some elders and talked to them. They were inclined to be suspicious at first, but after about an hour's conversation, during which we exchanged some tobacco for milk and honey, they became very friendly, and said we might see everything there was to see. Finally they took us right into the forest, to a group of huts.

The Dorobo build their huts in small clearings in the forest, in groups of two or three, and live in them for about three months, after which time they begin to fall to pieces, and also become full of fleas. They are very rough and comfortless structures, consisting of a framework of sticks stuck in the ground, and bent over, forming a domed roof, on which they tie leafed branches and wild banana leaves, covering the top with a skin to keep out some of the rain. In the middle of the hut is the hearth, and on the far side from the door the people eat and sleep, lying on a pile of skins. Very few tribes in East Africa live in such dreary shelters as these, which keep out neither the cold nor the rain.

The people live by hunting, which until quite recently was their only occupation; a few of them now possess very small herds of cattle—fourteen families living near Londiani own between them forty-five head, while one or two are starting to cultivate. They are thus an interesting example of a hunting people passing into the pastoral and agricultural stages simultaneously. At present the only animals kept in any number are dogs, which are of a different breed from the thin-nosed cur so common in African tribes; they are much fiercer, and are kept in better condition. They wear leather collars with small bells attached to them.

In hunting, the Dorobo use the bow and arrow, and the spear, which are poisoned with a concoction made from the keliot tree (*Acocanthera Schimperi*). The leaves and branches are broken up and boiled

till a thick, pitch-like liquid is obtained, when they strain it and store it in strips of bark, which are kept in the tops of trees out of the way of children. After preparing poison, they remove all traces of it from their bodies with the leaves of a kind of sage. An animal shot with this poison dies in a very short time. The flesh close to the wound is cut out, and the rest of the animal, including the the blood, is eaten. The Dorobo also catch animals in traps, of which they have two kinds. One is an oblong pit dug in the ground, about four feet deep, with wooden spikes at the bottom; across the top are laid thin sticks, and a covering of grass and leaves. The animal falls through the fragile covering, and is impaled. The second kind of trap is more complicated, though it can be set up with a few sticks in an incredibly short time. Some idea of its construction may be gathered from the accompanying sketch, in which details are given of the various parts here described. When the animal treads on the platform, the cord which holds down the main stick is released, and this stick flies up with the noose, thereby suspending the animal off the ground.

A GROUP OF FOUR OLD MEN.
The native next to the one holding a club is wearing a cap made of the fur of the hyrax or rock-rabbit; these caps are given as part of the price of a wife.

All kinds of animals are hunted, and most animals are eaten, including antelopes, elephant, various monkeys, lion, leopard, pig, and buffalo—in fact, the hyaena is almost the only exception. Of other foods, the Dorobo eat honey, and, when they can get it from the Nandi, a meal prepared from maize and eleusine grain. They also make honey-wine. Bee-hives are made of wooden slats tied together in the form of a barrel, and put in the tops of trees. Each man has his own barrel, and Arap Kimining gave us from his barrel some of the best honey I have ever tasted. When a tree has no branches by which the owners can climb to their barrels, they tie thin poles against the trunk with tree-rope, and climb up by them.

In matters of dress, the Dorobo have more or less copied Nandi fashions. Their clothes are mostly made of skin, though some wear pieces of cheap cotton-cloth dyed brown. The women wear leather skirts and upper garments; married women have large discs of brass wire hung from the lobes of their ears, which, in both men and women, are pierced and elongated. A Dorobo generally has only one wife, as he cannot support more. The price of a wife is as much honey-wine as four women can carry, together with a fur cap for the girl's father. This curious headgear is made from the hyrax or rock-rabbit.

Their arts and crafts are of a very primitive description. They make bows, arrow shafts, and baskets, which are used as currency to buy from the Nandi their iron tools—knives, arrow-heads, etc., a manufacture of which the Dorobo have no knowledge—and tobacco, beads, and pottery.

The Dorobo have a vague belief in a god, called Asis, who is the sun and masculine, and who has a sister, Arawa, the

THE MARRIED STATE.
This old woman is wearing the discs of brass wire that among the Dorobo denote the marriage state.

EAR STRETCHING.
The blocks of wood in the lobes of the ears are put in to stretch them. The hair is closely clipped.

moon. They do not make offerings to them, but before going to hunt, the men pray to them, saying, "O Sun (or Moon), fill us with food." They believe in a future life, and say that after death the soul goes to Spirit-land, which is under the earth and a bad place. The spirits there may be good or bad in their intentions towards mankind; the good spirits are those of their ancestors, and to them offerings are made of honey-wine and water, which are poured on the ground, with the prayer, "O Spirits, fill us with food, that we may be filled with health." No offerings are made to the bad spirits. At death, a person's body is carried out into the forest, and left for the hyaenas to devour. There are also magicians, who are all bad, and who by their spells prevent people from getting food.

A NATIVE HUT IN THE FOREST.
Such structures consist of branches covered with wild banana leaves and they quickly fall to pieces. Fleas also soon make them uninhabitable.

Where the Dorobo came from is quite unknown. It seems probable, however, that they are a more or less aboriginal people, who were living in the country when the Nandi and Masai came into it. They say themselves that they have always lived here. "The Masai came on one side of us, and the Nandi on the other. We do not know anything else." The Nandi have a curious story about the beginning of the world, to the effect that when God came to "prepare" the world, he found three things living on it—an elephant, the thunder, and a Dorobo. The elephant and the thunder were both afraid of the Dorobo, because he could turn himself over when asleep without getting up first. The thunder said, "I am afraid of this man; I am going to live in the sky," and he went, while the elephant laughed at him, saying, "This man is a little creature—he is nothing." The Dorobo said, "I am glad the thunder has gone; I was afraid of him; I do not fear the elephant." And he made poison, and shot the elephant. And the elephant, dying, called out to the thunder to take him to the sky; but the thunder said, "No; you laughed at me when I said the Dorobo was dangerous. Die by yourself." And the elephant died; and the Dorobo became lord of all the earth.

A somewhat similar Masai story has an elephant and a snake, both of which are killed by a Dorobo; it goes on to say that God told the Dorobo to come to a certain place early in the morning, as he had something to tell him. But a Masai who was hiding behind a bush and heard, went ahead of the Dorobo, and God let down a rope from heaven, by which descended to the earth a great many cattle. The Masai exclaimed in surprise, whereupon the cattle ceased descending, and God said, "You shall have no more, because you were surprised." And the cattle wandered off, and became mingled with those of the Dorobo, who could not tell his own apart. So the legend runs that the Masai took possession of them all, and from that day to this, the Dorobo have been savages with no cattle, and have had to hunt for their food.

As we were passing through the Tindiret district on the way up to visit the Dorobo, we were much puzzled one night, when near Kipkorom, by a wailing noise which came from the forest. This noise resembled the whistle of a Uganda railway locomotive, or a native wooden pipe. It cannot have been either of these, however, because the railway is too far distant for one to hear an engine; and it went on all through the night at intervals, one stretch lasting about half an hour. The Dorobo said they knew nothing about it; and a Nandi who had lived in that region when a child told me that it was the devils (*chemosisiek*). Chemosit is the Nandi devil with one leg and a mouth which shines like a lamp; it wanders about at night looking for children to eat, whom it entices by its singing.

I suggest that some perfectly harmless animal is the origin of this devil, for I once saw at night a small creature, probably a squirrel, which showed but one eye, and bobbing up and down as the creature moved its head this gave an impression of something hopping on one leg.

The legends and beliefs are full of interest; but the development of the Dorobo from a hunting to a pastoral and agricultural existence is their most noteworthy characteristic for future study.

# Bird-counting from the Train.

**By E. M. Nicholson.**

*Author of "Birds in England," etc.*

*The novel experiment of counting birds from the train would at first sight seem doomed to failure, but experience has proved otherwise. The figures obtained are incidentally of interest in regard to bird protection, which is usually obscured by fallacious beliefs.*

DURING July and August a year ago, at the time of the Alpine bird census already described,* I was travelling a good deal about Europe between Italy and Ireland, and on these journeys I amused myself by counting from the train all birds seen on one side of the line over definite sections of the route. Although in the absence of better material such a count is by no means without value, the errors inseparable from the method are obvious enough, and the result is not to be called a bird census. One is hardly likely to do justice to the titmice or warblers from a moving train, and the abundance of birds large or conspicuous in plumage or in habits, must tend to be exaggerated at the expense of the remainder. Identification will be more difficult, and frequently out of the question, especially in countries where birds are not all of familiar kinds. To an observer like myself, who relies at least as much on the ear as on the eye, the noise is a serious handicap—more serious, actually, than the vibration, which forbids the use of field-glasses. There is the further question how far the course of a railway is typical of the country it penetrates, since it necessarily includes the smallest possible proportion of hills and the largest of towns and valleys. Such limitations are plain, but there is one redeeming feature. They apply with equal force to the railways of every country, and do not therefore affect the cardinal requirement of a census—that its results shall be comparable with others. If small birds escape notice in England, they escape it as readily in France, so that while absolute figures are out of the question one may hope to obtain a serviceable denominator.

### Tunnels and Woods.

There remain two disturbing factors to be borne in mind. One is the length and frequency of tunnels, deep cuttings, and densely wooded country, which severely restrict the field of view and consequently the number of birds distinguishable. Where these did not occur commonly enough to have a very serious effect they were ignored; where the length of such blind sections became appreciable, as in the much-tunnelled climb to the Mont Cenis, they were roughly measured and deducted from the mileage covered. Where we ran unexpectedly into forests, which cannot usefully be dealt with in this way, the census was simply closed down from the last previous station. This was rendered possible by drawing a line after every few stations, or wherever the character of the landscape altered, and thus keeping the figures for the various sections distinct. It is impossible to break off between stations, because then the distance covered is unknown; otherwise it can be read off afterwards from any good time-table. Naturally, a count is almost useless without some sort of data regarding the amount of ground covered.

### The Speed Factor.

The other factor is, of course, the speed of the train. How far this affects the results depends on the observer; in my own case the degree of accuracy seemed to remain substantially the same up to thirty or thirty-five miles an hour and after that to fall off rapidly, till above fifty it was hardly worth continuing unless the country was exceptionally open. In England, where the expresses go fast for really long distances, this may give serious trouble; but abroad and in Ireland, where bursts of high speed generally alternate with stretches of slow going, I did not find much difficulty from it. A stopping train naturally gathers most moss, for at each halt the songs of small birds and their elusive forms become more easily distinguishable; but only the Italian and Bavarian counts were taken under these favourable conditions. Whatever speed bias exists is therefore in favour of these and against the French and English results, the Welsh and Irish being in this respect nearer the average. A not unimportant point is the post of observation. Naturally the view ought to be as little restricted as possible; the corridor or a corner seat facing the engine is the best usually obtainable, but in Bavaria I discovered the ideal in the open front platform of a 4th-class carriage, fenced simply by an iron grill hardly breast high—no glass, no bars, and nothing to limit vision except the coach in front.

* "A Bird Census in the French Alps." By E. M. Nicholson. *Discovery*, Part I, November; Part II, December, 1926.

As the data obtained are too numerous to print in full here, it will serve instead to comment on the points they bring out, summing them up as we go. It would be absurd to claim that any number of such counts, much less this handful, can serve as an analysis of the avifauna of different regions. But in the complete absence of data from most parts of Europe they may serve as soundings, taken haphazard, to help to indicate certain salient features, particularly of the composition of bird population, and even, perhaps, of its relative abundance. Thus the strength of birds so important in economics and in Nature as the rook, starling, magpie, and kestrel, may be ascertained with fair success even by a count from the train.

### Rooks and Starlings.

We find, for example, that in England about 38½% out of 610 birds noted in this way are rooks; in North Wales also 38½% out of 200; across Ireland about 36% out of 1,419; and in Normandy about 57% out of 632; while in the extreme west of Ireland (Connemara) the rook claims only about 1⅔%, and in all the German, Italian, and French (south of Paris) counts, its place is at least as humble, where it has any place at all. Here we have an incontestable example of a species dominant over a large area suddenly ceasing to play much part in the ecological scheme outside it. It would be roughly correct to say that between Galway and Paris the rook counts for considerably more than beyond those two points.

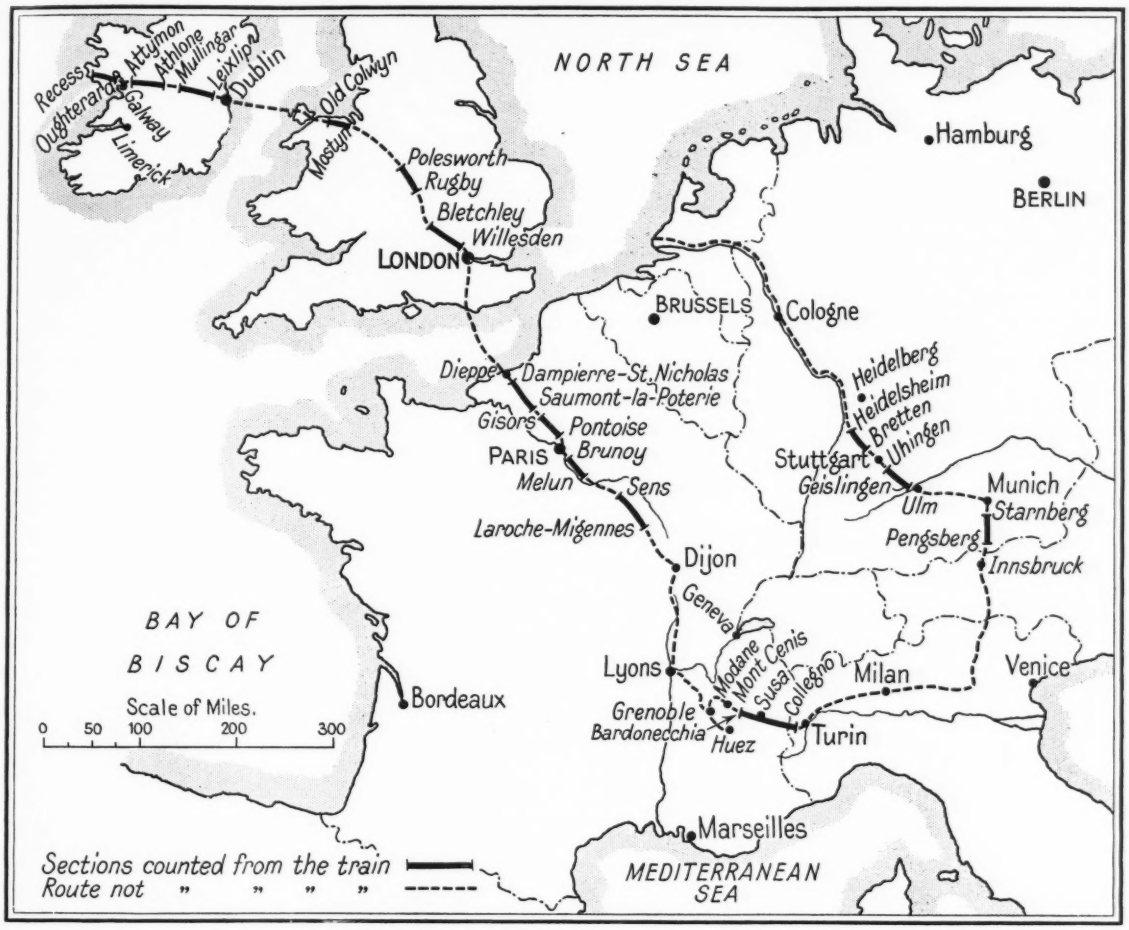
The starling, although everywhere more concentrated, makes a fairly similar appearance in the counts, so far as they go. It is strongest in North Wales with about 36%, and in the English Midlands with about 24½%. In the eastern half of Ireland it still has about 20½%, but after Westmeath there is a sudden failure of entries, and out of 467 birds seen along forty-eight and a half miles of track farther west in Ireland not one was a starling. (I am not, of course, suggesting that the starling does not occur west of Athlone—it undoubtedly does—but the arbitrary and not untypical cross-section drawn by the west-bound mail showed rather strikingly that at least in August the distribution of numbers between east and west cannot be anything like equal.) And although it drops out earlier than the rook as one goes north-west in the opposite direction, the starling remains longer an important member of the fauna. In the French totals south of Paris it still shows 20.4%, and in a small strip of Wurttemberg two separate flocks raise it actually to 67½%, although farther south in Germany it grows rare, and in Italy it altogether fails.

It is commonly believed that the Latin countries have next to no birds left, and in particular that they have killed off all their swallows and martins, and are a menace to ours on their migrations. While such a summary count gives no ground for being dogmatic, it appears to me that both Italy and France come out surprisingly well, if we assume that the sections by which they and other countries are represented are anywhere near typical. In Italy out of 426 birds about 12% were swallows, although a large part of the route was unfavourable to their presence; the Plain of Piedmont had 24%. In France the percentages of swallows in the two summer samples were very uniform at about 24% and 26%, averaging 25.22% for the whole. In southern Germany, where the people are much more friendly to birds, swallows (which from the nature of their haunts must be very sensitive on that score) amounted to just over 35% of 410 birds noted. This was due principally, however, to a single section where they rose to 59%; in another they represented only 4.75%, and in the third 13.5%. But in England, where killing a swallow is almost unheard of, the highest proportion recorded for any section was under 6% and the general average about 2.8%, while in North Wales it was only 1%.

### A Conclusion Confirmed.

Two years ago, in my book *Birds in England*, I had commented on the comparative abundance of swallows in Ireland, and this was borne out by the figures obtained—7% in the eastern half, about 5.5% in the western, and about 15% in Connemara. Perhaps a more reliable absolute criterion is afforded by the number of swallows seen per mile of count, which works out at about 0.25 in England, 0.1 in Wales, 1.19 in Ireland, 1.8 in France, 1.05 in Italy, and 3.4 in Germany. (Swifts, which averaged about 0.95 per mile in Germany and nearly 3 per mile in Italy had, alone among the species affected, already migrated before the remaining countries were visited, and no comparison was therefore possible. Their departure may have appreciably reduced the French and British totals as against the German and Italian.)

These data fail to sustain the common English opinion that Latin Europe has succeeded in exterminating its own swallows and a good many of ours into the bargain. They show, on the contrary, exactly what a naturalist would expect; that the relative numbers of the swallow tend to decline towards the northern and eastern limits of its range, and to increase towards the warmer parts, or those where insects flourish most. It seems likely that the higher




MAP OF WESTERN EUROPE SHOWING SECTIONS COUNTED FOR BIRDS.

percentage recorded in Germany may reflect some real advantage gained from protection, the power of which to increase numbers is undoubted; on the other hand, no ordinary persecution can reduce an important species far below its natural level in the balanced fauna unless there is some other capable of superseding it. Every count was made when the first broods were strong on the wing. It might be argued that southward movement affected the results, but in the Dauphiné Alps I watched carefully for migration and could find no trace of it until August, some time after the southern counts had been secured. That there was a certain amount of leakage before the English counts in mid-August is more plausible, but the Irish counts were the latest of all obtained, and they showed a larger crude number of swallows than any except the South German. The only count in which I found definite ground for suspicion was the French, which may have gained by immigration, though the suspicion does not seem to me a serious one.

The swallow, being conspicuous, instantly recognizable, and always in flight, makes an ideal subject for counting from the train. That the results obtained are reliable so far as they go is confirmed by analysis. Coming up from the Plain of Piedmont to the Mount Cenis I divided operations into three sections, the first being a stretch of plain from Collegno by Turin to St. Ambrogio, the second an upland valley from thence to Meana, and the third a really mountainous section to the high frontier village of Bardonnecchia. On analysing the figures for these three sections we find a striking contrast in their composition. The swallow, which had 24% in the plain, fell to 12% in the hills and *nil* in the mountains; on the other hand, the swift rose from *nil* for the plain to 9% for

the hills and no less than 80% for the mountains:—

PERCENTAGES OF TOTAL CENSUS.

| Bird | Plain Section | Hill Section | Mountain Section |
|---|---|---|---|
| Swallow ... ... | *c.* 24 | *c.* 12 | 0 |
| Swift ... ... | 0 | *c.* 9 | *c.* 80 |
| Italian Sparrow ... | *c.* 50 | *c.* 65 | *c.* 6 |
| Small birds, *Species?* | 20 | *c.* 8 | *c.* 1.4 |
| All others ... ... | *c.* 6 | *c.* 6 | *c.* 12.6 |
| | 100 | 100 | 100 |

In addition to the very large numbers of Italian sparrows recognized as such, a very considerable number of the "small birds unidentified" must certainly have belonged to this species; I should put the real numbers at 60% for the plain and 70% for the hills, dropping sharply to 6% for the mountains. If in the light of these striking figures we examine the German results we find the same tendency at work. The Heidelsheim-Bretten section on the fringe of the Rhine levels has about 13.5% of swallows and only 1.5% of swifts, but the other side of Stuttgart, in the Black Forest hill-country towards Ulm, the positions are reversed with 4.75% of swallows and *c.* 44% of swifts. At the upper end of the Starnberg-Pengsberg section the same thing was coming out when the count had to be broken off. Even in so high a latitude as ours one sees the preponderance of the swift growing with increasing altitude, although towns and several factors complicate distribution.

### General Results.

Apart from the German figures, the results here discussed form a summary and much interrupted cross-section across Europe north-west and south-east from the Atlantic almost to the Mediterranean. The sameness of bird life thus illustrated is almost depressing. Although 3,353 individual birds were included in the July-August counts, the number of identified species was only about forty, and a handful of forms are overwhelmingly strong compared with all the rest, as the following table shows:—

| Bird | Number | Approx. Percentage of Whole. |
|---|---|---|
| Rook ... ... ... ... | 840 | 25 |
| Swallow ... ... ... ... | 375 | 11 |
| Starling ... ... ... ... | 568 | 17 |
| Black-headed Gull ... ... | 242 | 7 |
| Sparrow (counting the house and Italian forms as one) ... | 221 | 6.5 |
| Swift ... ... ... ... | 176 | 5 |
| Lapwing ... ... ... ... | 146 | About 4 |

Thus the three strongest species outnumber all the rest put together, and the first half-dozen make up three-quarters of the combined totals. Naturally in this direction bird-counting from the train gives only a caricature of the true state of affairs, but a caricature is, after all, an intensification and analysis of salient features.

The choice of sections was not haphazard; although it was impossible to keep up indefinitely the strain of accurate counting, I was constantly observing and was able to form a good idea of the numbers of birds over long distances where no actual count was kept. All the counts taken were fair samples of much larger areas traversed, with the exception of the second French section (Melun-Brunoy), where the speed must have averaged sixty miles per hour and had a bad effect on the results, and the Irish section, which was more than a sample since it covered about half the distance from the Irish Sea to the Atlantic. The North Wales results, however, were typical only of the coast, which is followed by the Holyhead main line and has a much denser bird population than the hinterland. In order to make the results strictly comparable they were taken as early as possible in the morning; only the Bavarian count was compiled during the afternoon. In southern Europe the difference between the bird life visible say at 6 or 7 a.m. and at 2 p.m. is colossal. I suspect that this is one of the main reasons why Italy, France, and Spain are credited with a poverty of bird life which the counts did not confirm. Naturally the Englishman on the Riviera or in Italy sees far fewer birds about, and hears less song, than he would at home in the middle of the day. That does not necessarily mean that the birds have been slain, but quite possibly that he gets up too late in the morning. If I had made a count across Lombardy in the heat of the day I would certainly have come to the conventional conclusion that Italy has no birds.

### An Italian Adventure.

During the Italian count an amusing thing happened. Towards the frontier at Bardonnecchia some emissaries of Mussolini came along the train and found me so intent on my count that I did not at first realize their presence; bursting with suspicion they ringed me round, and snatched away the list, poring over it in an endeavour to connect it with some imaginary scheme of espionage. They interrogated me very sternly, but I was too much amused to attempt an explanation, and failing to find further proof they reluctantly let me have my papers back.

We may, then, take the results for what they are worth, and try to compare the bird population of the countries represented. Ireland stands out with

an average of 16.89 birds per mile, maintained over the impressive distance of eighty-seven and a half miles. But on examining this figure more closely we find an astonishing cleavage between Ireland east of the Shannon valley, with a census of 1,280 birds on forty-six miles, or 27.8 to the mile, and Ireland west of the Shannon valley, with a census of 198 on forty-one and a half miles, or 4.77 per mile. The main line to Galway and Connemara goes right across the middle of Ireland; divide it into halves and the eastern gives a census between three and four times as great as corresponding distances in Germany, England, and Italy, while the western gives considerably the lowest total in its class. Roughly speaking, the sparse population belongs to the peat moors and the dense population to open parkland and tillage. It is a dry peaty area between Moyvalley and Killucan which forces the average for that section of the eastern half down to 4.35 per mile, when none of the four nearest it fall below 24. The four highest July-August sectional averages were all east and central Irish, and four of the five lowest were west or central Irish also.

**Extreme Sections.**

As the Irish section averaged only eight and three-quarter miles long, while the rest (except the Welsh) were all fourteen to sixteen and a half, this is partly a statistical difference; but when I corrected that by linking every one with the one after it, Ireland still had five of the dozen most extreme sections with a minimum length of twelve miles, and these included both the highest and the lowest.

Wales, with 10.5 per mile, comes second, but this, as I have explained, is the favoured coastal belt and not typical. Germany has 9.65; England 9.4; and Italy 9.06—a curiously close bunch. No doubt the fact that so many English birds are small and hedge dwellers tells against them in this sort of cursory count. That the French average was only seven I attributed to the long stretch attempted at a faster rate than any of the others; the only section taken under comparable conditions came out at 9.32 birds per mile. In January, 1928, I had an opportunity to put that suspicion to the test by a further count from the Dieppe boat train—about twenty-five miles from Pontoise to Gisors and about thirty from Saumont-la-Poterie to Dampierre-St-Nicolas. This brought the total of French track covered up to eighty-seven and a half, the number of birds amounting to 861 (9.8 per mile) compared with 1,478 in Ireland on the same distance

The dominant rook (528 or *c.* 36% in Ireland; 266 or *c.* 30.8% in France), and the starling (207 or *c.* 14% in Ireland; 122 or *c.* 14.6% in France), made up surprisingly similar proportions of the totals. Except in the case of the rook, where they have been inserted, these January counts are not included in the foregoing comments, which refer to summer totals only. But the winter population of areas not seriously exposed compares as a rule quite well with the breeding stock, and it would be difficult to assert that any error there may be through treating these as comparable is likely to be in favour of France. The danger of thus using a higher figure than would have been obtained in August seems slight, for the weather in this region had just been extremely severe. I see no reason to doubt that these results, which put France in the same class for bird population as England, Germany, and Italy, are substantially correct so far as they go; the question how far our hedges raise our aggregate is, of course, outside their scope.

I know from a proper census that over large areas the type of English Midland country, which comes out at 9.4 per mile, has an actual bird population of between two and four to the acre; from this it looks as if large areas elsewhere in Europe may fall not far short of this density, although, of course, they are often inferior in the important item of cover, which tends to make our own bird population come out less favourably than it should by this method.

**Bird Protection?**

The cardinal merit of a bird census is not to compile statistics for pedantic use; it is to bring out things which are obvious enough once distinguished, but incapable of being learnt by the ordinary observer in any other way. The haphazard figures obtained, which are of no absolute value whatever, may, I believe, help to give perspective where it is badly needed; to show how uniform the bird life of Europe is over wide areas, and how grudgingly one dominant species yields place to another. They may also help to din in the first lesson which bird protection has to master, that bird populations of similar areas under similar conditions will be similar, whether the inhabitants persecute them or not. The difference between protection and persecution is not a difference between presence and absence of birds, and it is not essentially a question of numbers, although other things being equal a species will certainly be commoner where it is adequately protected. The main change which protection can effect is a growing confidence of birds towards man; so long as the issue is obscured by fallacious beliefs about numbers, little progress in that direction is likely to be made.

# Two Rarely-Visited Egyptian Temples.

By G. A. Gardner.

*As a member of an expedition which was working there under the auspices of the Royal Anthropological Institute, Captain Gardner visited two remarkable ruined temples in the northern Fayum desert.*

NUMEROUS peoples of all nationalities congregate in Egypt during the winter months, and no doubt visit during their stay most of the recognized and famous monuments of antiquity—the Pyramids of Gizeh, Sakkara, Luxor, and a host of other places as well known to the travelling public, as, shall we say, the Riviera; but how many, I wonder, of the general sightseeing crowd have ever heard of, much less seen, the small so-called XIIth Dynasty Temple of Qasr-es-Sagha, or the very large Ptolemaic one of Dimê? It is my intention to give a brief account of these two interesting places, for owing to their inaccessibility very few Europeans have ever seen them, and nothing much is really known about either. To begin with both lie off the beaten track, right out in the desert near the Fayum Oasis and some forty or fifty miles from Cairo; no roads nor even tracks exist, so a motor-car in very good pulling condition is essential. The Egyptian State Railways run a good service to Medinet el Fayum, and from there a light railway can be taken to the village of Tamieh, which is the nearest point in the cultivation, on the eastern side, to the ruins. It is, however, advisable to arrange for motor transport at Fayum itself and to take a guide, if possible, from there, but it is absolutely essential to have a trustworthy car of good qualities, for as will be seen the journey across the desert is exceptionally trying and the going is at times appalling, and very few of the ordinary Arab taxis can be trusted to go ten miles without breaking down.

THE INNER SHRINE AT DIMÈ.
This temple encloses a rectangle 300 by 200 feet in area, and some of the ruined walls are over 40 feet high.

As I was particularly anxious to inspect these two sites, a day was decided upon for the visit, and we left our camp very early in the morning carrying with us ample supplies of food and water, not omitting extra petrol and oil for the car.

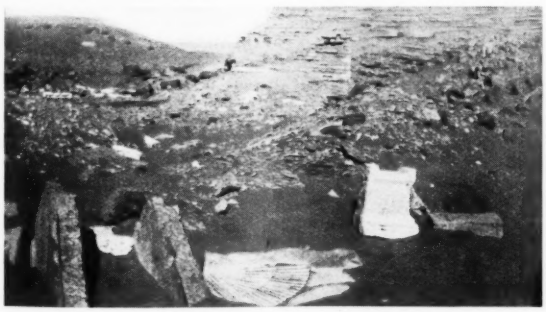
For the first five or ten miles the going was not at all bad, as we kept as far as possible to the limestone scarps and ridges, but occasionally belts of thick sand had to be negotiated, through which the car crawled on reduction gear. The views obtained from these ridges during the early hours of the morning are exceptionally fine, as they are something so completely out of the ordinary. Vast waves of desolate country, dotted sparsely here and there with small scrub-like bushes — stretch down on either side; to the north-west tower a long line of red frowning cliffs appearing like a series of huge terraces, and which we are gradually approaching. Every now and then we catch glimpses of the lake Birket Qarun shimmering in the morning light below us. All too soon we leave our limestone scarp and descend a long gradual slope that brings us to a huge depression thickly carpeted with the detestable sand. Here one of my companions, who knew this part of the desert well, asked me if I could pick out the Temple of Qasr-es-Sagha which lay just before us on the cliff. Try as I would, however, I could see no signs of any building, the same red tone pervading all the rocks, and as the sun was now getting higher everything appeared one blend of colour with no distinct and visible detail. Finally the temple was pointed out to me, surprisingly camouflaged, as its colour was the colour of the cliffs and all the surrounding hills, and only the small dark patch of the open doorway showed black against the general reddish tinge of the whole neighbourhood.

We ploughed through the thick sand covering the floor of the valley, and after many twists and turns

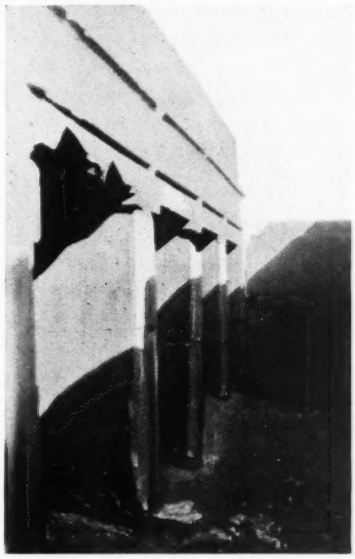
crept up the sandy wady leading to the temple itself. Here we left the car and made the rest of the way on foot, until finally we came out on the platform or terrace on which the building is erected.

There it stood before us—small, weather-beaten, unknown, and almost forgotten. By whom it was built and why we do not know. No hieroglyphics on its walls tell us its past history; no writing or graffiti of any sort have ever been discovered to tell us what Pharaoh of perhaps the XIIth or even much earlier Dynasty erected this lonely mortuary chapel in a spot so desolate and far from human surroundings. Perhaps the old builder himself lies buried in those red cliffs that tower up terrace upon terrace behind his forgotten sanctuary, and sleeps there secure in the knowledge that his resting place is never likely to be disturbed by the curious hands of man.

As I have stated, the temple is a small one, perfectly plain with no hieroglyphics nor sculptures of any sort, only a large bead or moulding runs around the tops and down the front panels of the seven small cell-like chambers, the sole ornamentation in the place. The building itself is rectangular, 80 feet by 29 feet, and consists of a narrow central hall or passageway, off which run the seven nitch-like recesses, but what their use was it is impossible now to say. The temple is built of immense limestone blocks, laid and fitted carefully without mortar. So close in fact are the joints that it is impossible to insert a needle between the stones. The masonry may be termed "cyclopean," as the majority of the blocks are enormous, one measured being 8 feet by 6 feet by 30 inches, while the huge inner door lintels are all formed from single pieces of limestone of great size. It is curious to observe how the ancient masons shaped the different blocks to fit one to the other, some being bevelled, others notched out, and no time or trouble was spared to get an accurate joint and to preserve an even face without gaps in the wall.



THE SACRED SYMBOL OF THE SUN.
Near the small altar is seen a partially buried stone, carved with the sacred winged symbol of the sun.



THE QUASR-ES-SAGHA TEMPLE.
View showing the inside walls.

How these colossal masses were lifted and fitted is a puzzle, but the engineering skill displayed and the extreme accuracy of the proportions of the building denote a constructional skill of the very highest order. In the thickness of the front wall is a passage, its purpose being also a mystery, but a spyhole looking out into the main entrance seems to point to its use for the purpose of enabling the old priests to observe the incomers without themselves being seen.

The terrible effects of sand and wind erosion are well seen at Quasr-es-Sagha, the huge blocks being literally eaten away and undercut by the corrosive action of the wind-blown sand. This is particularly noticeable on the northern face, as the prevalent winds blow from that direction, and it is quite clear that unless the authorities take some steps towards its restoration or preservation that before very long this interesting and unique temple will be nothing more than a mere tumbled heap of ruins.

I think the general impression it gave me was one of forlornness; poor lonely little temple standing neglected on its rocky ledge, forgotten alike by gods and men, for how much longer will it stand gazing out over the ever-changing desert sands? Not much longer, I fear, unless pity be taken upon it.

Our brief inspection having been completed we returned to the car and reversing it, not without some difficulty, made our way down the wady and back to the sandy depression at the cliffs' foot. Alternating patches of thick sand and moderate going enabled us to make further progress west at a reasonable rate, until we struck a patch of country the like of which it has never been my lot to travel over. I have motored over several countries, including some of the alleged roads in South Africa, but never before have I encountered such a chaotic confusion of tumbled rocks and boulders of all shapes and sizes. At first glance one would consider it impossible for any wheeled

vehicle, except perhaps an ox wagon, to negotiate such country; but we went straight for it and zigzagged between and sometimes over jagged limestone slabs of terrifying proportions, slid and bumped down gullies, crept slowly up the opposite face, and finally (when I had begun to reflect that there could not be a tight bolt left in our trusty six-wheeler, we arrived at the foot of an enormous mound, and I knew that our destination had been reached at last.

Dimê, Dimei or Dimay—spelt in several ways, as the Arabian language allows the greatest latitude as regards its vowels, but the consonants must be rigidly

LOOKING DOWN THE DIMÊ CAUSEWAY.
Here the temple is seen flanking a paved causeway four hundred yards in length, and terminating in a pair of steps at the desert edge.

adhered to—occupies a long ovate mound on the northern end of which the great temple is situated. A sandy track strewn with the remnants of broken pottery leads up to what was formerly the northern entrance, and passing through the crumbling ruins we enter the vast courtyard of the sanctuary. What a scene! To those who knew the shell-torn buildings of Flanders the broken walls of Dimê will seem oddly familiar. We have the heaps of tumbled bricks, smashed and battered stones, crazy walls fantastically set at impossible angles and, in fact, the whole aspect of the place is that of a building torn and riven asunder by some titanic convulsion.

In spite, however, of the destruction and consequent chaotic state of affairs, the general plan or idea of the place can be distinguished. Mighty walls of sun-dried brick still towering in places 40 feet high enclose an enormous rectangle 300 feet by 200 feet. The construction of these walls is peculiar, but typical of Ptolemaic buildings of the same material throughout Egypt. They are approximately 8 or 9 feet thick at the base, but taper gradually upwards to perhaps 5 or 6 feet. They were for some extraordinary reason built in large sections, each block being quite distinct and not bonded into its neighbour, a totally wrong principal in brick laying. Through some cause or other the centre courses have sagged to a great extent, presenting the curious spectacle of many large segments of circles running from section to section in the fashion of an immense number of loops. Traces of a passage in the thickness of the wall enabled the priests to make a circuit of the building without descending to the ground, and to see and hear without being seen or heard.

Directly in front of us as we stand at the north gate lie a heap of ruins, the truncated columns of a building emerging above the general debris. This, to judge from the scattered fragments of well worked stone, from a small altar and from a block with the sacred winged symbol of the sun carved on it, was the first shrine or fane of the temple proper. This is the first portion of a series of large structures that occupy the centre of the court, and run from the northern entrance to near the southern.

To the rear of the first shrine, and probably connected to it, is a bewildering number of apartments built of coarse rubble, which in its pristine state had been plastered inside and out with a hard cement coating. The rooms therein are small, and it is not known for what purpose they were intended.

The southern portal of this group is constructed of well-dressed limestone blocks, tastefully moulded and champhered, and must have presented an imposing appearance in its original state. Leaving this entrance we stand once more in the courtyard, the southern doorway of the temple immediately before us. There had been formerly a range of rooms close to the main walls, but except for a small group in the north-west corner all these have been practically destroyed, and a large amount of spadework is necessary to make their plan and purpose clear.

### The "Sacred Way."

As we pass through the gaping hole where once stood the southern gate of the temple, a broad causeway in quite a tolerable state of preservation slopes gently down before us. Paved with large slabs of stone it runs south for about 400 yards, terminating in a pair of steps at the desert's edge. This was beyond question the "Sacred Way" so common to Greek temples in general, and along which in times long past the worshippers of the old gods made their way to offer incense and sacrifice to the deities of an age long gone by. The ruins of well-built houses are to be seen on either side of the causeway, and one cannot help feeling that all is part of an original and preconceived plan, for many large ancient Egyptian temples were an entirely self-contained community, weaving their own cloth, baking their own bread,

fashioning their own pottery, and so forth. From the similarity of structure, their regular plan, and absence of all erratic distribution, the temple and its environs at Dimê appear to have been such a community.

It is said that Isis was worshipped here and also Sobek, the god to whom the crocodile was sacred, but no inscriptions are visible and much work has to be done before the history of the mine is made clear. Unfortunately, some fifty to sixty years ago, when the interest in ancient buildings was not so great as at present, the powers that were then in the land allowed a contractor for "Sabakh," a fertile earth containing salts and obtained from ancient sites, to use the spot as a vast quarry; and more damage and destruction was wrought in the short time during which the contract was in force than was ever effected by the hand of man previously or by the erosive action of the desert winds.

Dimê was called by the ancients "Soknopaiou Nesos," and very much like an island it must have appeared when nearly surrounded by the floods of the irrigation, for an extensive canal system recently discovered affords proof that much land that is now under desert conditions was formerly cultivated and inhabited during the prosperous reigns of the early Ptolemies. Under their degenerate descendants, however, or perhaps even much later, the desert, always lying in wait, reclaimed its own, and where once were fair fields and pastures the yellow sands now reign supreme.

### Desolation.

Nothing, I think, that I have ever seen affords such a complete picture of desolation as Dimê. One is awed and oppressed by its immensity and the complete absence of all active life. As I stood by the desecrated shrine shortly before sundown, there was not a breath of wind, no note of bird or beast broke the deathly stillness of it all; and as the long shadows cast by the ruined walls began to creep over the ancient courtyard one could well imagine the awe and terror in which the natives held this place, and even feel the spirit of Isis brooding over her ruined fane, or fancy the horrid vision of Sobek, hovering black and menacing, lurking in the shadows. *Ave atque vale.*

It was, however, well worth the time and trouble to have seen this interesting and lonely ruin, and it is to be hoped that money will be forthcoming for its complete and scientific excavation, for within its crumbling walls much may be learned concerning this fascinating and debatable land—the Fayum.

## Correspondence.

### IS THERE A SURPLUS MALE BIRD POPULATION?

*To the Editor of* DISCOVERY.

SIR,

Your contributor, Mr. E. M. Nicholson, whose book "How Birds Live" was reviewed in your columns, deals in the Third Appendix with the problems of mapping out bird territory on the basis of bird song, and warns against assuming that every singing bird represents a pair, "because many of the cocks that sing the loudest and the longest through the nesting season are mateless birds." This opens up a very interesting question and has given me the clue to the interpretation of certain facts

UNMATED GREAT SKUAS, SHETLANDS.

which have puzzled me not a little in recent years when observing birds in the breeding season. Is there a surplus male bird population? If so, are there more males than females born, or is the mortality among the females greater? I cannot pretend to answer the latter, but some observations of mine may throw some light on the former question.

I have for the last three years in April, May and June observed the warblers in an area of about 100 acres of oak and hazel coppice (G 12, G 13 and G 14 in Mr. Nicholson's classification of types of country), interspersed with meadows and pasture (H 1 and H 2). I have found that regularly each year five or six cock nightingales arrive and sing until the middle of June. But after careful searching of the area I am never able to find more than one, or at the utmost two, nests. Moreover, after the middle of June, careful watching cannot reveal more than one or two broods of young which have left the nest. On the other hand, the cocks that do not appear to be mated sing perhaps a week longer than those that have broods, but soon after the middle of June cease singing too. Now the area of my observations is on the most extreme westerly limit of the nightingale's distribution, namely in the western end of the Severn valley. So far as I know, they never occur in the valley of the Wye and surrounding regions. Is it possible that the cock nightingales, as they enter the country at the south-east corner in Kent and Sussex, spread northwestwards to their usual limits and that the hens, coming some ten days later and being less in numbers, do not reach the outer marches of the nightingale territory in sufficient numbers to mate with all the cocks who have occupied territory there? If this is so, it postulates an excess of male population.

I suspect a similar state of affairs among the willow wren and

chiffchaff population of this area. I have for the last three years found the nests of both these species within about thirty yards of the same spot each season. Cock birds take up their vantage posts and carve out territory which seems to be always the same. But there are some singing cocks outside the area occupied by the nesting pairs which seem to have no mates, or at least I can see none and careful search of the hedgerows and long grass reveals no nests.

Going now to a quite different region, I had occasion to watch this summer the colony of the great and Richardson's skuas at Hermaness in the Shetlands. It was possible to map out roughly the territories where these two species were each nesting in colonies of from ten to fifty pairs together. But there was one place on the hill where there were a number of fresh water tarns and some marshy ground. Round this spot there were gathered a colony of great skuas, who never seemed to leave it. I thought at first that they might be birds from the nesting colonies who had gone there to bathe in the fresh water to get rid of parasites, as the kittiwake gulls so frequently do. But closer observation led me to the conclusion (and the watcher on the hill agreed with me) that they were unmated cock birds, which, unable to breed this season, had drawn in from the surrounding nesting grounds on to this apparently neutral territory. (See photograph.) It is well known that skuas are extraordinarily jealous of intruders on their nesting grounds, but I never noticed all the time I was there any of the birds from this neutral ground resent the presence of any bird or animal, whether sheep or human. The evidence seems to point here also to a surplus male population among the skuas.

On another island in the Shetlands this summer I also had occasion to watch for a short time some red-necked phalarope. They were in a marsh near the seashore, and to my surprise I found that the colony consisted of two cocks and one hen. On closer watching I saw that the hen went with one of the cocks and that the other more frequently held aloof from the pair. Here then were a cock and a hen phalarope which had paired, for I found the nest already constructed on the edge of the marsh, although the eggs had not yet been laid. But in spite of the pairing a surplus cock had remained there and was keeping to himself in a little bit of neutral territory at one end of the marsh. This on a small scale bears out the evidence of the skuas.

This whole question of the balance of the sexes of the bird population requires more investigation. If it exists, and it seems to me that it does, is it permanent, or does it vary with the seasons and depend on the rate of mortality of the hen population, and does this in turn depend on the rigour or absence of rigour of the winter? I do not pretend to know, but I can only express a hope that all who can possibly collect material on this subject should do so and record it. The ornithology of Victorian times used to be concerned with a rather stilted classification of birds into their families and genera, the colour of their plumage, their anatomy and the size and marking of the eggs. No doubt this in its day was work that had to be done. But to-day the unknown field of study lies in bird ecology, the relation between birds and vegetation associations, problems of population, sex and generally in the economy and society of bird life.

Yours, etc.,

The Grove, M. PHILIPS PRICE.
Taynton, nr. Gloucester.

(Mr. E. M. Nicholson is at present out of England, but on his return our contributor's problem will be brought to his notice. It is hoped to deal fully with this interesting subject in a later issue.—ED., *Discovery*.)

## THE CHINESE PUZZLE.

*To the Editor of* DISCOVERY.

SIR,

I am very interested in your recent references to Yenching University, Peking, as I am not long home after having spent three years as accountant in the Construction Bureau, which has built the new plant including the wall you referred to. I enclose a photograph showing a section of the wall: in the foreground is the open-air swimming pool; left, a pillar of a Chinese bridge ballustrade; right, a Chinese house typical of the district. The door in the wall is usually kept heavily sand-bagged.

Your comment July, page 204, that "China is turning to a

national consciousness" contains, in my opinion, the real clue to most of what is happening in China—over and above the endemic civil war—just now. I am sure the tremendous power of ancient family loyalty and its complement, loyalty to personal leaders as distinct from party or cause, is scarcely known and certainly not realized outside Asia. Public and national loyalty is at once both a disintegrating ferment and the seed of the new spirit from which only the future unity of China can come. I place much more faith in the growth of this idea than in "anti"-ism, whether anti-British or anti-Japan, waves of which do not last very long and always contain a lot of artificial, superficial effects, resulting from the terroristic methods of the paid agitators.

Yours faithfully,

Colchester. H. W. F.

## AN APPRECIATION FROM PERU.

*To the Editor of* DISCOVERY.

SIR,

I have to thank you for your kindness in sending me two copies of the April number of *Discovery* and to express my high appreciation of the excellent review you have been good enough to give to Professor Barker's report on our work in this Andean Sierra.

If you can spare me a further two copies I shall be glad to have them, as I am desirous of sending one to His Excellency the President of the Republic.

Again, thanking you,

I am, yours faithfully,

ROBERT J. STORDY, Colonel.

Chuquibambilla, Peru.

# Summer and Autumn Travel Notes.

*Below are given particulars of various travel services available this summer. The remarkable development of locomotion in recent years has left little new ground for the pioneer, but even to-day few people appreciate how far they may travel during quite a short holiday.*

THE progress made since the War in travel arrangements has been so rapid that most people take for granted the galaxy of rival opportunities which summer now has to offer. The recent developments in this sphere are perhaps only paralleled by those of wireless: in the ease with which messages from stations all over Europe and even from America may be obtained, it is natural to forget the early efforts of so recently as 1922, before any official broadcasting had been instituted. In the same way, the spectacular speeds of the aeroplane to-day tend to dwarf the older methods of travel, in which, however, improvements are steadily taking place. The following example was more striking before the War, but it still serves to illustrate the change that is becoming more marked as every year passes. The Emperor Caligula journeyed from Rome to London in twelve days, and eighteen centuries later, in 1840, Sir Robert Peel took exactly the same time to cover the distance. It is not inappropriate to recall this comparison, in 1928, when Rome may be reached by air in twelve hours.

On another page this month a contributor describes a voyage of 4,000 miles to the North Cape in Norway, which can be made in a two weeks' return journey by the B. and N. Line from Newcastle. These steamers maintain the mail service up the Norwegian coast, and run three times weekly throughout the year, although tourist traffic is not recommended after the end of August. More luxurious cruises are offered by the Royal Mail Line, and this month the *Arcadian* makes a final trip to Norway, Spitsbergen, and the Baltic, leaving Leith on 12th August. Two days earlier the *Araguaya* leaves London for ten days in the Norwegian fjords. An attraction for visitors to Sweden is the International Esperanto Congress which opens at Gothenburg on 11th August.

### Switzerland.

Switzerland is so closely associated with winter sport that few people are yet aware of its opportunities for a summer vacation. Those fond of climbing and walking have long explored the inland heights, but recently steps have been taken to develop Lausanne as a summer resort. There is now in full activity at the Lausanne-Ouchy Plage, on Lake Leman, a bathing and sporting centre where such new pastimes as water-sledging are provided. This resort on the Swiss "Riviera" is within fifteen hours of London, and the waters of the lake are thrown into picturesque contrast by the snow-capped peaks of the surrounding mountains.

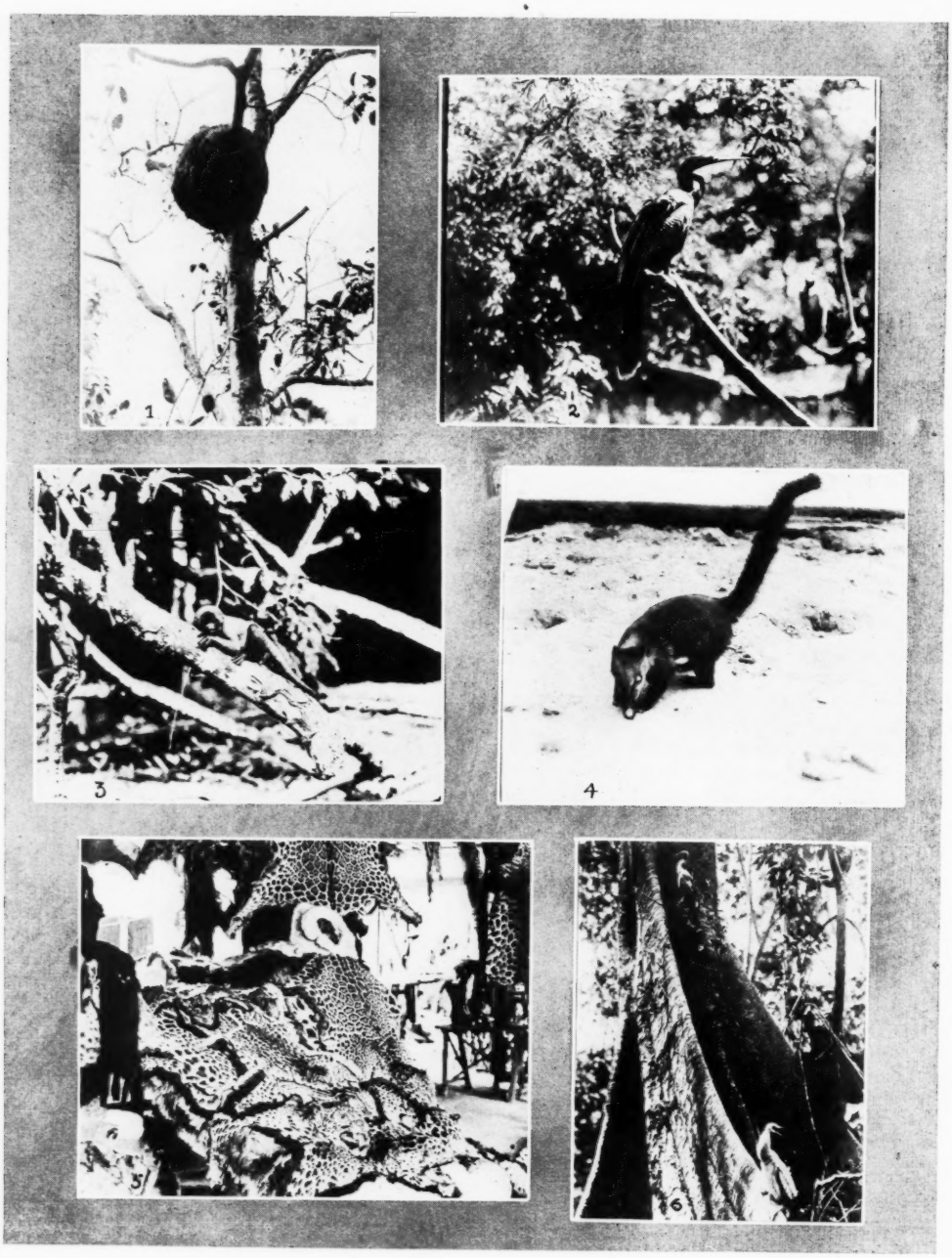
### The Near East.

Since the discovery of the Tomb of Tutankhamen, a visit to Egypt has made a strong popular appeal, while those with archaeological interests are provided every year with an increasing harvest of treasures. It is therefore not surprising that a book devoted entirely to Egypt, the Nile, and Palestine has been prepared by Messrs. Thomas Cook, who also run a service of Nile steamers. The routes to the Near East are of wide choice. In addition to the Bibby Line steamers to Egypt, certain Mediterranean cruises embrace the North African ports, and there are holiday facilities on the Peninsula and Orient Line, which offers special terms to Port Said, for Cairo, and the Syrian coast. The same line operates the "Southern Motorway," a new combined steamer and motor service between London and Marseilles.

Constantinople and the Bosphorus are now brought within the scope of a short vacation by the Royal Mail Mediterranean cruise, in the *Arcadian*, which leaves Southampton on 5th October. Railway travel in south-eastern Europe is thus avoided, a factor of advantage to the less experienced traveller. A glimpse of Greece is afforded on this same cruise, which calls in at Phaleron Bay for Athens, before proceeding to Malta and Tangiers.

Those who have time for a longer cruise may explore the West Indies under favourable conditions, as the Royal Netherlands Steamship Company is offering a reduced return fare, including ten days stay in Trinidad. The *Cottica* departs from Dover on the 18th August, and the return voyage is made in the *Venezuela*, which reaches England again on 2nd October. At other periods the Harrison Line run excellent boats on this South Atlantic route.

Of similar duration is the six weeks' cruise to South America and the Amazon by the Booth Line, sailing



NATURAL HISTORY OF THE AMAZON VALLEY

These photographs refer to the accompanying travel notes and show: (1) Tree ant's nest at the Taruma Falls. (2) A brilliant bird of the Cormorant family. (3) Barrigudo monkey (*Lagothrix Humboldtii*). (4) Racoon taken at Pará. (5) Furrier's display at Manáos, illustrating a variety of skins. (6) Egrets on a buttressed tree in an Amazon forest.

from Liverpool in the *Hildebrand* on 14th September. The cruise is unique in that it combines a long sea passage with two thousand miles of romantic inland waters. In spite of the abundant display of tropical flora and forest growth, the climate of the Amazon is scarcely hotter in summer than during the warm winter months. Bathing is enjoyed throughout the year at Pará, on the lower reaches of the river, which before the development of the Florida coast was a pleasure resort of the more wealthy Americans. For the naturalist the Amazon offers a great variety of species. The vegetation includes unusual orchids and the giant Victoria Regia water lilies, while there are many curious animals, besides the birds and insects of brilliant colour. Some of these are shown in the accompanying photographs. To provide for passengers who hesitate to bathe in the river waters, the *Hildebrand* is fitted with a deck swimming pool, which is also of service on the sea journey. An incidental but attractive feature of this cruise is the visit to the Portuguese Riviera, and afterwards to Madeira, the " Island of Flowers " in the calm waters of the southern Atlantic.

The cruise of longest duration beginning in the autumn is that of the Canadian Pacific liner *Empress of Australia*, which for 164 days, from 14th November to 26th April, 1929, will travel round the world covering some 36,000 miles. During nearly the whole period, summer weather will be experienced, for visits will be paid to places of interest in sunny climes such as Egypt, India, China, Japan, Honolulu, the Philippines and Singapore. Christmas Day will be spent in the Holy Land and New Year's Eve in Cairo. Many places off the beaten track will be touched, and a passage will be made through the Panama Canal, on the way to the West Indies, before proceeding to the United States.

These notes necessarily deal with only a few of the many travel services available, but they would be incomplete without a reference to the publications now issued by the British Dominions. The High Commissioners in London, in particular of Canada and South Africa, are offering books which deal with many aspects and are fully illustrated. One of these, for example, is devoted to trout fishing in South Africa, and another to motoring. Indeed, the travel companies equally are realizing the value of well-produced literature, and their brochures to-day, many of them illustrated in colour, are in marked contrast with the badly printed " time-tables " which have been characteristic hitherto. No one who contemplates a holiday should make final plans without first studying these sumptuous publications.

# Among the Stars.

By A. C. D. Crommelin, D.Sc. F.R.A.S.

### The International Union Meeting.

THIS great gathering of astronomers at Leiden last month passed off very pleasantly; perhaps the chief value of these meetings is the opportunity afforded for private discussion of plans and ideas. The following may be mentioned among the resolutions adopted. Funds were voted which it is hoped may lead to the completion within a few years of the great photographic star-map and catalogue begun in 1887. A rectification of the constellation boundaries was decided upon; these are in many cases confused and irregular, and are laid down differently by different atlas makers; the lines will be made as straight as possible. There was a decided majority against the use of the phrase "Greenwich mean time " to denote time reckoned from midnight, as this was liable to lead to confusion; all who publish astronomical observations are therefore asked to make quite clear what time they are using. It was also decided to use the equinox of 1950 as far as possible in computations, to avoid the inconvenience of frequent change of date. Where galactic coordinates are employed, the starting point is to be the star Alpha Cygni, not the intersection of the galaxy with the equator, since this is not a fixed point. Arrangements were made that telegrams announcing the discovery of comets should give some notes of their physical appearance which will be of use to observers and computers. It was decided to retain the parsec (*i.e.* the distance at which a star has an annual parallax of one second—it is about $3\frac{1}{4}$ light-years) as the unit for measuring stellar distances; the distance used for determining absolute magnitudes is to be ten parsecs, as already used by most astronomers. The next meeting of the International Union is to be held early in September, 1932, in the United States, a few days after the total solar eclipse which will be visible there on 31st August, 1932. American astronomers have played a conspicuous part in the remarkable advances that have been made in the last few decades, which makes the choice of meeting-place appropriate, and it is hoped that the double event will attract many European astronomers.

### The Solar System.

I have received a new work entitled, " A Theory of the Solar System " (P. J. Harwood) with a request for some notice in these columns. I take the opportunity to offer a few general remarks on works of this character. First, attention should be called to the extreme accuracy with which predictions of the positions of the sun, moon and planets can be made, when we use the tables of their motion which have been constructed on the assumption that Newton's theory of universal gravitation is true. Predictions made many years in advance are verified within a very few seconds of arc (a second is the angle subtended by a thumb-nail two miles away). This verification of prediction is a proof that the Newtonian law is an exceedingly close approximation to the true law, and that any modification required by it should give very nearly the same results as the original law, but with a diminution of the small residuals between theory and observation.

An example is Einstein's slight modification of Newton's law, which explains the fact that the perihelion of Mercury's orbit moves faster by 43 seconds per century than the amount deduced from Newton's law. Mr. Harwood, however, has not

proceeded in this manner; he gives no numerical comparison of theory with observation, but talks in a general way about electrical and magnetical forces, and the behaviour of iron filings in a magnetic field. There is no occasion to deny the presence of electrical and magnetic forces in the solar system; in fact, the former are invoked by many astronomers to explain the violent repulsive action observable in the tails of comets; but they are inappreciable compared with the gravitational forces, except in the case of very finely divided matter. The particles forming the heads of comets are doubtless small, but not small enough for these forces to be appreciable, and the heads of comets are observed to move in agreement with the gravitational theory. A more serious fault in Mr. Harwood's work is the assertion that electrical and magnetic action produce not only radial forces, but also transverse ones. The absence of the latter is demonstrated by the closeness with which Kepler's law of equal areas is fulfilled.

Newton showed in an elementary manner that where a body is describing areas at a uniform rate about a point, it is either acted on by no forces, or the forces are wholly to or from that point.

As an example of its author's vagueness I quote a sentence from page 71 of this book. "It is no doubt futile to attempt to gauge how much attractive movement is contained in the 50 seconds per year of obliquity decrease at present reigning." The actual decrease is 47 seconds per century, not 50 per year, and it is fully explained on the Newtonian theory by the slow change in the position of the earth's orbit plane, due to the attraction of the other planets. The planes of the orbits of all the planets are undergoing similar changes.

# Book Reviews.

## THE CARNEGIE TRUST REPORT ON PUBLIC MUSEUMS.

*A Report on the Public Museums of the British Isles (other than the National Museums)*, by Sir Henry Miers, F.R.S., D.Sc., to the Carnegie United Kingdom Trustees. (Edinburgh: T. & A. Constable. 1928).

*A Report on American Museum Work.* By E. E. Lowe, Ph.D., B.Sc. Published by the Carnegie United Kingdom Trustees. (Edinburgh: T. & A. Constable. 1928).

**Reviewed by Sir Frederic Kenyon.**

Sir Henry Miers' report on Public Museums, published by the Carnegie United Kingdom Trustees (and obtainable on application to their secretary), will, we hope, mark a definite epoch in the history of British museums, and render them a service comparable to that of the analogous report of Professor W. G. Adams in respect of the Public Libraries. It is a stock-taking of the present position of the provincial museums, based upon personal inspection of the greater part of them by Sir Henry and his assistant, Mr. S. F. Markham, embodying statistics, criticisms, and suggestions which come with unquestionable weight from an authority so well qualified by experience and soundness of judgment.

Sir Henry Miers' verdict on the present condition of the museums of the country as a whole is summary and uncompromising. "At present, in spite of certain noteworthy exceptions, they fail—and fail lamentably. There is no doubt that the country is not getting what it should from the public museums, and that most of them are not going the right way to supply what is wanted." Here are a few of his criticisms in detail: "The distribution of museums in the British Isles is of the most haphazard nature"; "In only a dozen or so is there a full-time competent curator with an adequate staff"; "Rarely, except where a collection has been made with judgment by an archaeological or natural history society, has a beginning been made on sound lines"; "Only ten per cent of the museums in the country are housed in a separate building (good or bad) designed for the purpose"; "Very few are provided with the storage rooms or work rooms which are essential"; "There are comparatively few museums in which the labelling and arrangement can be regarded as satisfactory from the point of view of the average visitor"; "Apart from some of the museums in the larger towns, there is scarcely a general museum in the country that is really well arranged, well housed, provided with the necessary storage and work rooms, and adequately staffed." Finally, "to put it bluntly, most people in this country do not really care for museums or believe in them; they have not hitherto played a sufficiently important part in the life of the community to make ordinary folk realize what they can do. The very word 'museum' excites quite the wrong impression in the minds of people who have never seen one of the few that are really good. This is not surprising when one considers how dull many of them have become and how low the worst of them have sunk."

This is a sufficiently serious indictment, and points to a clear-cut alternative. Either museums, as public institutions spending public money, should be abolished, or the country should put its house in order with respect to them. The former alternative is, it may be hoped, unthinkable. Whatever may have been the case formerly, during the last generation the interest of the public in antiquities, and perhaps (though less certainly) in natural history, has been increasing rapidly. The Press has done much to foster this interest. The educational value of museums is increasingly recognized. The national museums and the great provincial museums are visited by ever-increasing numbers, for purposes both of recreation and of instruction; and here and there small local museums, planned with a definite purpose and guided by competent and enthusiastic curators, are doing services of real value to the community. At a time when every influence which combats the forces of ugliness and materialism should be cherished in order that the soul of the community may be kept alive, it would be criminal to neglect institutions which have such potentialities for good as our museums.

The Carnegie report comes, in fact, at an opportune moment. The local museums of this country have for the most part grown up fortuitously out of collections made by travellers or individual enthusiasts, and have been left to exist as they could, with inadequate means and haphazard staffing. The country is just beginning to be aware of their potentialities, and here and there localities have tried to develop them; but the movement is only beginning to gather strength. The report, it may be hoped, will strengthen the hands of those who are trying to educate public opinion. It indicates some of the defects; it suggests improvements that may be tried. It should arouse a sense of shame in backward communities. It should encourage local authorities to be more generous in

providing for the institutions for which they are responsible. It may give hope to starved and neglected curators.

Some of the remedies suggested by Sir Henry Miers may be briefly mentioned. Museums should have a definite scope and purpose. They need larger staffs, better paid and better educated. They should co-operate with one another by exchanges and mutual loans, thus getting rid of objects which do not fall within the accepted scope of each museum, and promoting that variety of exhibitions which is the chief means of keeping public interest alive. Certain special museums are needed, notably for agriculture, nautical history, and local life and customs. Travelling collections should be organized, perhaps upon a county basis, especially for use in schools, but also for such subjects of general importance as hygiene or local industries. The national museums might be asked to help with inspection and advice, and perhaps to constitute a permanent advisory board. Lectures, labels, guide-books, and visits by schools and adult classes should be organized. Municipalities and counties should recognize their responsibility for turning the museums within their jurisdiction into active agencies for public service.

Useful hints with regard to some of these activities, especially on the educational side, may be derived from America; and here Dr. Lowe's report is a valuable supplement to that of Sir Henry Miers. It does not profess to be an exhaustive survey of that very extensive field; but Dr. Lowe visited many of the most enterprising museums in America, and his experience enabled him to make the most of a limited visit. Conditions in America differ so much from those at home that direct imitation is neither possible nor desirable; but much may be learnt in detail, and in particular we should do well to emulate the whole-hearted belief in education which is so widespread in the best parts of the United States.

If the Carnegie Trustees, armed with these reports, can see their way to apply to the museums of this country the same wise stimulus and guidance which has done so much for the libraries, they will render yet another service to the spiritual well-being of our nation.

*Slavery in the Roman Empire.* By R. H. BARROW. (Methuen. 15s.).

Here we have an admirable account of the most remarkable and characteristic institution of antiquity at its time of greatest development. Mr. Barrow reviews the conditions of slaves during the first two centuries of the Empire—in the household, on the land, in trade and industry, and in the service of State and town. He is familiar with the literature bearing on the private life of this period, and has ransacked the ten thousand inscriptions of Dessau to good purpose. We might perhaps wish that he had made more use of the earlier literature; Latin comedy gives us interesting sidelights on many of the topics which he discusses, and Imperial conditions cannot be fully understood apart from their Republican origins. Still, limitation of some kind is here undoubtedly necessary.

Slavery is so ill-sounding a word that any dispassionate examination of its actual workings tends to become in some measure a defence. No one seriously blames the Romans for adopting what was indeed a universal institution. As to the use which they made of it, that is a complicated matter, the study of which gives us glimpses into some of the most unlovely features of the Roman character. It is, however, gratifying to discern a general tendency towards amelioration of the slave's lot—even if this process arose out of nothing higher than enlightened self-interest. Slavery became more than a mere institution which treated men as tools; it grew into a vast educational system which fitted untold multitudes of backward folk for the burdens and honours of citizenship. Particularly interesting in this connexion is the account of the *collegia*. Through them and through pride in his work, some barbarian might, and often did, acquire social standing and culture.

Mr. Barrow is cautious in his treatment, but in many places he disagrees with conventional theories. This is particularly the case with regard to the *latifundia* and the supposed destructive effect of slavery and the importation of corn on the peasant life of Italy. Here in general he is in accord with Rostovtzeff. Of special value in his description of the *peculium*, though here we are left in doubt as to the extent of the master's rights, or rather as to the extent of what is known about the master's rights. The reference to Pliny I, 4 on page 49 seems to take too seriously what is surely a semi-humorous passage.

The reader will probably be most interested in the comparison between ancient and modern slavery (to the advantage of the former) and in the speculation as to how far slavery was responsible for the fall of the Empire. As to this last problem, we are left without any definite answer. Slavery, and the mingling of peoples which it assisted, were part of the very fabric of Rome. They contributed both to her greatness and to her decline. But the real causes of that greatness and that decline are to be found elsewhere, if at all.

W. BEARE.

*A Textbook of General Botany for Colleges and Universities.* By R. M. HOLMAN, Associate Professor of Botany in the College of Letters and Science of the University of California; and W. W. ROBBINS, Associate Professor of Botany in the College of Agriculture of the University of California. Second Edition. Chapman & Hall. 20s.).

**Reviewed by Professor A. C. Seward.**

Most teachers of botany have probably been tempted, at some stage of their career, to write a book which might be used by their students as a source of knowledge and set the lecturer free to spend more time on general principles and in providing the wisdom which lingers far behind knowledge. Fortunately, or in some few instances unfortunately, some teachers have resisted the temptation; many have fallen. The authors of the book under consideration, in the preface to the first edition, express the opinion, shared by a large body of their colleagues on both sides of the Atlantic, that a textbook which presents the "whole content of the usual lectures and the fundamentals of general botany would result in better teaching, since it would make it possible for the instructor to devote more of his time and energy to the more effective work of recitation, conference and quiz." It is not clear what is meant by recitation—one hesitates to suggest the possibility of a class reciting in unison even the most moving utterances of a lecturer—but "conference and quiz" are, no doubt, what we should call a catechetical class at which questions and discussions are encouraged, a method beneficial to teachers and students alike and insufficiently used in this country. The practice of formal lectures is too firmly established to be easily abandoned; most of us are conscious of the fact that a much better way might be found. The trouble is that the majority of elementary students regard lectures as substitutes for books, and the easiest course is to be accommodating and treat students as buckets to be filled. The question is how far have the authors succeeded in providing an adequate and stimulating book?

A partnership between a Professor of Botany in a College of Letters and Science and a Professor in an Agricultural College was a happy idea; the authors hold the sound view that agricultural students will "profit more by a broad survey of the whole field of botany . . . than from a special course . . . restricted to those aspects of botany which are capable of the most obvious and direct applications to agriculture." It is in the highest degree desirable persistently to emphasize the importance of laying foundations in the only true way, by insisting on pure science as the basis of applied science. An interesting feature of the new edition is the inclusion of brief statements of certain principles for the benefit of readers who have had no adequate training in chemistry and physics; to some students these excursions into physical science will be helpful, though in a general botanical textbook it is impossible in a few pages to supply a satisfactory substitute for preliminary courses in chemistry and physics. The authors have made plain many physiological descriptions which are often presented in terms unintelligible to readers imperfectly equipped with a knowledge of chemistry.

The first part is devoted to the structure and physiology of seed-bearing plants, and occupies more than half the volume; the second part consists mainly of a survey of the plant kingdom. This arrangement has presumably been found by the authors the most convenient method of approach, but whether it is the best method educationally is open to question. There is much to be said in favour of beginning with a general description of some familiar flowering plant; having used as an illustration of a highly specialized type some common plant, in which the principle of division of labour is most clearly expressed, the lecturer can then proceed to a general survey of the plant kingdom, beginning with unicellular green plants and working up through colonial, filamentous, and more elaborate forms to the higher vascular plants. The advantages of this method are that the student becomes interested at the outset in the idea of evolution, and he is better able to appreciate and to follow a general comparative treatment of biological types and plant forms after, rather than before, he has been introduced to representatives of the various groups.

The book may be described as a good introduction to botany; it is clearly written, and pains have been taken to minimize the difficulties inherent in the order of presentation which has been adopted. The average student should have no difficulty in obtaining a true picture of the cell, plant-tissues and plant organs, and of the principles of physiology; the chapters are not overloaded with detail and the illustrations are generally satisfactory. The term dictyostele is applied to stems of Dicotyledons in which the vascular bundles are separated from one another by pith-rays; surely this is not the usual definition of a dictyostele as illustrated by the stems of many ferns. The account of the corm might with advantage be fuller and more clearly related to the life of the plant. In the figure of an anther (Fig. 175) the fibrous layer and other important details are omitted. It is all very well to avoid detail that is merely tiresome and unnecessary, but when anatomical features are obviously capable of correlation with function it is important that they should be fully described. There is a tendency, no doubt caused by a striving after simplicity, to adopt one interpretation without any reference to other equally possible interpretations. The cone-scale of a pine affords a good example; the morphological description given by the authors may be correct, but it would certainly not be accepted by all botanists. In certain instances it is not only fair to give more than one view, but it is very important to lose no opportunity of encouraging students to think for themselves. Our object is to encourage students to teach themselves, and if we can awaken their critical faculties by offering alternative interpretations of morphological features, and leaving them to form an independent opinion, so much the better.

In Part II many of the selected types are clearly described and on the whole adequately illustrated. It is unfortunate that no account is given of the life-history of *Laminaria* or of some other brown alga in which an alternation of generations has been proved to occur. As in many textbooks the Gymnosperms do not receive as full a treatment as they deserve. A serious defect is the neglect of extinct types, which should at least be mentioned and the more interesting briefly described even in an elementary textbook. There is much that is admirable in this American textbook, and such criticisms that are offered are made in a friendly and appreciative spirit.

*Engines.* By PROFESSOR E. N. DA C. ANDRADE. (G. Bell & Sons. *7s. 6d.*).

Not the least striking achievement in the brilliant career of Sir William Bragg is the remarkably high standard which he has set for the annual Children's Christmas Lectures at the Royal Institution of Great Britain. These lectures have become one of the outstanding scientific events of the year, and the man of science who is honoured by the invitation to deliver them is faced by no easy task. Last Christmas the choice was a happy one, for Professor Andrade has a wide reputation as a man, not only possessed of profound scientific knowledge, but one who is gifted to an almost unique degree with the power of imparting it in a lucid and entertaining manner.

Professor Andrade is a physicist (among other things), and it is a somewhat novel thing for such a one to choose "engines" as his subject. It is a fascinating theme, and its choice argues a shrewd understanding of juvenile psychology. The title of the lectures alone was quite enough to ensure a crowded lecture theatre and to sell thousands of copies of this book.

"Engines" is so full of good things that it is difficult to know which to mention first. The first chapter, dealing with the rules all engines must obey, is a skilful lesson in elementary mechanics and thermo-dynamics, made very palatable indeed by numerous ingenious and fascinating experiments. The tense and happy expressions on the faces of the audience after the first lecture (the frontispiece), will cause a pang of envy to stir the soul of many a school science-master. The graphic descriptions of early engines, and the principles upon which they work, form an interesting prelude to the detailed explanations of all the important modern engines which have developed almost out of all similarity to their crude forebears.

The next section of the book is concerned with reciprocating engines, and in this chapter, of course, is comprehended all the details of modern locomotives. Notwithstanding the fascination which locomotives always possess, many readers will think that the two most interesting chapters in the book are those which follow, and which describe turbines and internal combustion engines respectively.

The chapter on turbines is an education in itself. The relationship of the toy turbine of the early seventeenth century drawn by Branca, and the gigantic 50,000 kilowatt Parson's Reaction Turbine at the Crawford Avenue Power Station at Chicago, may seem at first sight to be non-existent. The author, however, draws the *character* of the turbine with a sure hand, and we are made conscious of its persistence through

all its modifications in the most vivid manner. It is opportune at this particular chapter to refer to the splendid plates which adorn this book. There are thirty-five of them altogether. Those illustrating the turbine chapter are superb. One of the most striking is a gigantic low-pressure turbine rotor (with blades) weighing no less than fifty-four tons. Another shows a marine geared turbine with all the covers removed, and displaying the parts that have been so well described in the text.

Internal combustion engines have a strong claim on the imagination, for they are familiar to everybody as motor-car engines, and they also provide the motive power for those awe-inspiring denizens of the deep called submarines. No boy can fail to be thrilled by a description of a large Diesel engine.

Professor Andrade calls this chapter "Putting the furnace in the cylinder," and in it he tells us all about motor-car engines, aeroplane engines, and big Diesels.

The last chapter deals with the way in which refrigerating machinery is operated, and the author hints at developments whereby heat may be collected in the garden and persuaded to come indoors and warm the house.

This book should be in the hands of every boy in the country, as it will be in those of a large number of grown-up boys. It is one of the best seven-and-sixpenny-worths that we have seen for some time. It is particularly well produced and the plates, as we have said, are excellent. There are also numerous explanatory diagrams which are well drawn and are always to be found when demanded by the text.

It would be an omission indeed not to mention the dedicatory verses to Sir William Bragg. The dedication illustrates the author's remarkable versatility, and is a most graceful and apt compliment to the great physicist to whom it is addressed.

V. E. PULLIN.

*Wildfowl and Waders.* By MAJOR HUGH POLLARD. Illustrated by the late FRANK SOUTHGATE. (Country Life. £3 3*s*.).

No one should know more about the ways of wild duck and such winged game than the man who goes out to shoot or snare them. But the sportsman, unfortunately, is not always a scientific observer; and even when he knows more about his particular sort of game than its nesting places, its speed on the wing and the size of shot to take to it, he has not, as a rule, any grace with the pen when he tries to put his knowledge into writing—or print.

But Major Hugh Pollard, the author of this sumptuous book, beautifully illustrated by the late Frank Southgate, is at once sportsman and naturalist and good writer, which is the reason why his book will appeal as much to the man who goes hunting with no more deadly weapons than camera and spyglass, as to the gunner who is willing to crouch in his hide all day on a Norfolk marsh for the chance of a shot at wild goose or sheld-duck.

And some of the birds which may make up the sportsman's bag at the end of a lucky day on such a marsh provide very interesting problems for the ornithologist. There is that fascinating problem of migration; what it is that brings the flocks of wild duck to these shores at the same time every year from their breeding grounds in Siberia or even farther north. Many theories have been advanced by ornithologists; but we still do not know whether it is the mere blind working of instinct that brings the wild duck south to our coasts in the last fortnight in October—if they come at all—or whether the flight has a practical reason in shortage of food or bad weather on the breeding grounds.

Major Pollard himself contributes a new theory to the discussion of this point. He suggests that the shortening of the days and the lengthening of night in the northern latitudes may be the cause of the wild ducks' southward flight; a flight in which wind may be a considerable factor, not only to the birds but also to the sportsman waiting news of their arrival.

Sometime the duck do not come at all. What puts them off? No one knows. All that is known is that if the great main invasion of migrant duck—perhaps preceded by small scattered parties—does not come within the twenty-second of October and the first of November, "you may wait in vain for their arrival that year; some will come, but generally speaking average numbers will be down two-thirds, and it will be a bad duck year."

Another fascinating problem is why wild geese fly always in that triangular formation called a "gaggle"; and whether perhaps one gaggle has the onerous duty of leading the rest during the migrating season. Anyway, even when a large flock is flying together, the individual "V's" which compose it keep station with the accuracy of a squadron of battleships. Perhaps this is due to the fact that the leader of the "V" is nearly always the oldest and largest and no doubt wisest bird. The younger birds fly at the side.

"Geese appear to rely for protection against their enemies entirely on their eyesight, rather than sense of hearing or sense of smell. It would seem that each individual gaggle leaves this duty to the flight leader. Shoot the leader and all is confusion; shoot a side bird and the discipline of the group is not half so affected."

But wild geese and wild duck are only two of the many varieties of wildfowl and waders with whose ways the author of this book is very familiar. Dunlin and snipe and godwit, whimbrel and curlew and teal, he knows them all, with the intimate knowledge of the naturalist as well as that of the sportsman: how they nest, what they eat and what they are like to eat. His book is therefore one to interest even those who, in the words of the old proverb—which has become rather corrupted—do not know a hawk from a hernshaw.

K. K.

*A Short History of Medicine.* By CHARLES SINGER, M.A., M.D., D.Litt. (Oxford University Press. 7*s*. 6*d*.).

This is no mere history of the advances in medical knowledge and surgical technique from the earliest times, still less is it a compilation of biographies. It is a pleasantly written record of the tendencies towards definiteness in thought which in the course of ages have made the healing art a science. There is a refreshing perspective attained in this work, for Dr. Singer does not, like many other historians of medicine, devote a large amount of attention to the views and speculations of the ancients, and then find that he has almost no space in which to deal with the very important advances of the last one hundred and fifty years. The whole of the history of Greek and Roman medicine, including the work of Galen, occupies only the first eighty-one pages out of a total of three hundred and fifty-one, so that the ancient days are not allowed to attract too much attention.

The important contributions to physiology by Bell, Magmore, Marshall Hall, Müller, Claude Bernard, Ludwig, Helmholtz, Schwann, Köllike and Virchow are described in sufficient detail to enable us to relate them to the advances made in our own time. It is the continuity of achievement that impresses us in Dr. Singer's narrative; a discovery is not merely described

and left in a chronological pigeon-hole, it is at once related to the state of matters at the present day. The book teaches us some modern medical science as well as ancient history.

The sections dealing with the rise of bacteriology and its subsequent specializations, the study of immunity, and some practical applications as to the "conquest of the tropics" and what has already been done to banish malaria and yellow fever, are as interesting as any in this book. To understand this part of Dr. Singer's exposition is to receive a liberal education. Much of the childish anti-medical and anti-scientific point of view—the view of the "cranks" of to-day—is as much the outcome of sheer ignorance as of mental inertia and ineducability. The "conscientious objector's" act in regard to vaccination could never have become law if its promoters had been informed in early life of what preventive medicine means, has accomplished, and may yet achieve.

The book closes with a discussion of such topics as the revolution in nursing, the modern conceptions of internal secretion, vitamins and nervous integration.

There does not seem to be any reference to the work of Berzelius who did so much for chemistry and introduced the notion of "catalysis" into scientific thought. The names of those in the modern period who built up the "Newton doctine"—Waldeyet, Golgi, and Cajal—we look for in vain. And indeed, neither Fleurens nor Gall are mentioned in the narrative of discoveries in the nervous system.

Something must be said about the illustrations. They are numerous, they all show what they are intended to, some of them are made available here for the first time, and many of them are from out-of-the-way sources.

D. Fraser-Harris.

*How Animals find their Way About.* By Etienne Rabaud. Translated by I. H. Myers. (Kegan Paul. 15*s*.).

This new volume in the International Library of Psychology, Philosophy, and Scientific Method, is by an author who is a well-known entomologist and whose work has been largely upon wild bees and wasps.

After Chapter I, which details the problem and the method of the author, there are two chapters upon insects, one dealing with the orientation of flying forms and the other with that of walkers. These occupy about ninety pages and are very good, the argument being worked out with great care. Chapter IV deals with the orientation of other invertebrates, and begins with a short paragraph on the termites, which seems to have got out of place. The information in this chapter is most meagre, being almost confined to the movements of the limpet.

The next chapter, on the vertebrates, is also poor by comparison with the earlier ones, as the author has by no means exhausted the available material nor, to my mind, has he exhausted the arguments in favour of his own view, which is that animals possess no special sense of direction, but that they find their way about by using the ordinary senses, chiefly sight and touch.

It is interesting to note that, whereas the author regards flying insects as relying largely upon the recognition of objects along the path of flight and walking ones as relying largely upon the position of the sun, Dr. Ernst Wolf has recently stated that bees rely largely upon the latter.

Although our author's arguments, based upon experiment, appear to be convincing, the question is evidently not finally settled.

Frank Balfour Browne.

*In an Unknown Land.* By Thomas Gann, M.R.C.S., L.R.C.P. (Duckworth. Cheap edition. 10*s* 6*d*.).

*Mystery Cities.* (1925).

*Ancient Cities and Modern Tribes.* (1926).

*Maya Cities.* (1927). By the same author. (Duckworth. 21*s*. each volume).

For some years past Dr. Gann, the well-known archaeologist and traveller, has made a practice of publishing annually a volume dealing with his explorations of the previous winter in Central America. This argues a confidence in his public which not every writer might find justified by the event. Dr. Gann has no need to fear the verdict. The areas he covers, Honduras and Yucatan, are in large part unknown, and penetrated only by the chichle hunters who gather the raw material for chewing-gum; and the object of his search, the lost cities and forgotten culture of the ancient Maya civilization, has that grip on the imagination which for most is the element of attraction in the attempt to reconstruct the history of a vanished past from the material fragments still preserved to us in the passing of time. Add to this that Dr. Gann has a lively and graphic pen, an ability to select from the multitude of impressions in the jungle those which will appeal most vividly to the reader, and an eye for character, eccentric and otherwise, in both Indian and White. For these reasons alone Dr. Gann will not weary his public; but he is fortunate that, in addition, he has been able to record in each season discoveries which have been valuable additions to our knowledge, and on occasion have bordered on the sensational.

In the earliest of these volumes, "In an Unknown Land," the interest is divided between the archaeological and the ethnographical, for in addition to exploring unknown and unvisited cities of the east coast of Yucatan, he succeeded in penetrating the country, usually barred to Europeans, which is inhabited by the Santa Cruz Indians, who are here described for the first time. In the following year, 1925, he was digging at the then newly-discovered city of Lubaantun, now being explored by the British Museum Expedition, a site on which have been found monuments, both as a whole and in detail, unique in America. It promises to be the most remarkable of all the sites of Central America. It is indeed fortunate that it has been found possible to undertake its systematic exploration. Among the most important discoveries recorded in "Ancient Cities and Modern Tribes" was that remarkable ceremonial causeway of cut stone connecting a previously unknown and vast Maya city, the third largest in Yucatan, to the ancient social and religious centre of Chichen Itza, fifty miles distant. A discovery which gained wider publicity at the time was the discovery of an inscription giving a Maya initial series date A.D. 333, which is nearly three centuries earlier than any of the three other initial series dates known from Yucatan, and proves an earlier penetration of the Maya to this part than was previously suspected.

The last volume under notice, "Maya Cities," does not fall behind the others in interest either in its descriptions of ancient cultures, or in its account of the Indians. Indeed, in regard to the latter, it records ceremonies in which Dr. Gann took part and religious beliefs still to a large extent unaffected by Christianity, which may well go back to the Maya. But most thrilling of all Dr. Gann's adventures was a hunt, unsuccessful it is true, for a treasure temple upon evidence as romantic as any lover of treasure-hunting stories would desire. What this evidence is we leave it to Dr. Gann to tell.

E. N. Fallaize.